H. F. HUNT

PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

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ABSTRACTS 2748–2960

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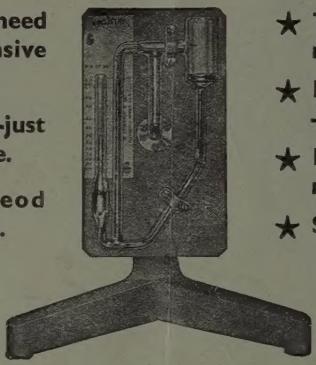

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MATHEMATICS

2748 513.272 = 5

On the circles orthogonal to two given circles. FANO, G. *Rev. Univ. Tucumán A*, 2, *pp.* 87–94, *Dec.*, 1941.

2749 513.578.71

On the quadrics of Moutard. PA, C. *Rev. Univ. Tucumán A*, 2, *pp.* 67–77, *Dec.*, 1941.—Residual osculating conics on a given Moutard quadric are determined, and a characteristic property of a pencil of quadrics discussed.

2750 513.728.1 = 4

On the algebraic surfaces. Complete intersections of hypersurfaces. GODEAUX, L. *Rev. Univ. Tucumán A*, 2, *pp.* 211–216, *Dec.*, 1941.—A determination of the surfaces satisfying the conditions that their canonic system is formed by hyperplane sections, or that they are complete intersections of hypersurfaces.

2751 513.735.6 = 5

The determination of the umbilics of an algebraic surface and some more general questions. LONGHI, A. *Rev. Univ. Tucumán A*, 2, *pp.* 31–49, *Dec.*, 1941.—Brusotti's generalization of a problem in Cayleyian geometry is extended to include a surface with singularities.

See Abstr. 2759 513.738 : 517.54

2752 513.761.3

Cremona involutions belonging to the Bordiga surface in [4]. SNYDER, V. *Rev. Univ. Tucumán A*, 2, *pp.* 203–210, *Dec.*, 1941.—A study of quadric surface pencils in [4] space.

2753 513.766

Some remarks concerning the stability of analytic mappings. SIEGEL, C. L. *Rev. Univ. Tucumán A*, 2, *pp.* 151–157, *Dec.*, 1941.

2754 513.84

The conformal mapping of Riemann surfaces not of genus zero. COURANT, R. *Rev. Univ. Tucumán A*, 2, *pp.* 141–149, *Dec.*, 1941.—For domains of genus p, normal domains K can be found by cutting the plane along $2p$ pairs of parallel slits [cfr. *Math. Z.*, 3, *p.* 114, 1919]. This result is extended to the case where the wider domain B is non-orientable.

2755 513.84 = 3

The geometry of extended configurations. I. An extension of the concept of configuration. STECK, M. *Rev. Univ. Tucumán A*, 2, *pp.* 331–356, *Dec.*, 1941.—A formal establishment of fundamental principles.

2756 513.881 = 6

On spaces D_0. BALANZAT, M. *Rev. Univ. Tucumán A*, 2, *pp.* 169–175, *Dec.*, 1941.—Various theorems concerning distances in quasi-metric space are established.

See Abstr. 2815 517.432.1 : 621.315 : 531.66

2757 517.54

Conformal geometry of third-order differential elements. KASNER, E., AND CICCO, J. DE. *Rev. Univ. Tucumán A*, 2, *pp.* 51–58, *Dec.*, 1941.—A discussion of the Kasner–Comenetz group G_6, a fundamental 6-parameter group based essentially on the conformal horn angle measure.

2758 517.54

The two conformal covariants of a field. CICCO, J. DE. *Rev. Univ. Tucumán A*, 2, *pp.* 59–66, *Dec.*, 1941.—A study of the conformal geometry of non-isothermal fields.

2759 517.54 : 513.738

Transformation theory of isothermal families and certain related trajectories. KASNER, E. *Rev. Univ. Tucumán A*, 2, *pp.* 17–24, *Dec.*, 1941.—The theorem that conformal transformations are the only point correspondences of the plane which carry all isothermal families into isothermal families is extended to include lineal element transformations. Isogonal and multiplicative trajectories are discussed.

2760 517.63 = 4

Riemann's formula in Laplace's transformation. PASTOR, J. R. *Rev. Univ. Tucumán A*, 2, *pp.* 217–243, *Dec.*, 1941.—After a review of previous investigations on the Laplace transformation, the author studies the conditions under which $f(z)$ may be represented as a Dirichlet series in the interval $(0, \infty)$, and the inversion by Riemann's formula.

2761 517.93 = 6

On the differential equation $y''' = G(x, y, y')y'' + H(x, y, y')y''^2$. TERRACINI, A. *Rev. Univ. Tucumán A*, 2, *pp.* 245–329, *Dec.*, 1941.—An extensive study of geometric, projective and dynamic problems leading to the equation stated in the title, such as third-order contacts of conics, varieties ∞^3 of 3 elements, trajectories, satellites, invariants and differential forms.

2762 517.942.932 = 5

On the asymptotic form of the integrals of the differential equation $y'' + A(x)y = 0$ in a particular case of stability. ASCOLI, G. *Rev. Univ. Tucumán A*, 2, *pp.* 131–140, *Dec.*, 1941.

2763 517.944.4

Simultaneous linear partial differential equations of the second order. INCE, E. L. *Proc. Roy. Soc. Edinb. A*, 61, 3, *pp.* 195–209, 1942.—Discusses the transformation of certain systems into hypergeometric systems.

2764 517.948.34 : 537.591.1 : 539.152.1

Exact solution of the equations of the general cascade theory with collision loss. IYENGAR, K. S. K. *Proc. Indian Acad. Sci. A*, 15, *pp.* 195–229, *April*, 1942.—A general solution is given of the integro-differential equations of the cascade theory for given boundary conditions, using the exact expressions of the cross-sections for radiation loss and pair-creation as given by the quantum theory, and taking collision loss into account. In the particular case of complete screening, an approx. solution is derived in a form suitable for calculations. The exact solution for this case satisfying the boundary conditions is given in 2 other equivalent forms, and it is shown that the solution of Bhabha and Chakrabarty is completely equivalent to them.

2765 517.949.3

A finite-difference function theory. ISAACS, R. P. *Rev. Univ. Tucumán A*, 2, *pp.* 177–201, *Dec.*, 1941.—

A study of monodiffric functions, i.e. functions whose difference quotient is the same when taken in the purely real and purely imaginary directions. Theorems analogous to the classic contour-integral and residue theorems are established. It is suggested that further developments may yield a new connection between the theory of numbers and analysis.

2766 518.12 : 539.385

Torsion of multiconnected thin-walled cylinders. BARON, F. M. *J. Appl. Mech.*, 9, *A72–A74*, *June*, 1942.—The author develops an arithmetical procedure for the analysis of problems of torsion. The method of analysis presented is one of successive approximations. The solution to a problem is guessed at and successively corrected until the controlling conditions of static equilibrium and of continuity of deformation are satisfied.

See Abstr. 2811 518.3 : 531.224.4

2767 518.3 : 541.25

Molecular-volume nomograph for liquid alkanes. DAVIS, D. S. *Industr. Engng Chem.*, 34, *p.* 797, *July*, 1942.

See Abstr. 2954 518.3 : 551.571

2768 519.214 = 6

Some new deductions of functions of limit probability. DIEULEFAIT, C. E. *Rev. Univ. Tucumán A*, 2, *pp.* 25–30, *Dec.*, 1941.—Some functions defining the limit probability of certain events under specified conditions of sampling are derived.

See Abstr. 2786 519.24 : 523.531

2769 519.272.15

A rapid method of correlation for continuous time series. GLOCK, W. S. *Amer. J. Sci.*, 240, *pp.* 437–442, *June*, 1942.—A "trend method" of correlation has been devised for use with continuous time series. It possesses the advantages of simplicity and speed over the std. method. The method includes the calculation of an index to reveal the presence of a few fluctuations of great intensity if such exist in the data.

2770 519.443

Some deductions from Frobenius's theorem. MILLER, G. A. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 251–254, *June*, 1942.—The theorem concerning the number of operators of a group G is proved separately for the case of G being an Abelian group.

2771 519.444

On monothetic groups. HALMOS, P. R., AND SAMELSON, H. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 254–258, *June*, 1942.—Various theorems concerning these groups are proved.

ASTRONOMY. GEODESY

2772 522.1

Report of the Dominion Astrophysical Observatory, Victoria, B.C., for the years 1940 and 1941. PEARCE, J. A. *J. Roy. Astr. Soc. Can.*, 36, *pp.* 273–287, *July–Aug.*, 1942.

2773 522.15

Design and construction of eclipse apparatus. GARDNER, I. C. *Nat. Geogr. Soc., Contrib. Techn. Pap. Solar Eclipse Ser., No.* 2, *pp.* 4–19, 1942.—A detailed description is given of the apparatus used by the expedition sent by the National Geographic Society and the National Bureau of Standards to observe the 1940 eclipse in Brazil. The apparatus, which was specially constructed for this eclipse and future ones, consists of 2 corona cameras, one equipped with a rotatable polarizing screen, and 2 slitless concave-grating spectrographs, each of focal length 10·5 ft., recording the ranges 3 000–5 500 Å and 5 000–10 000 Å, respectively. Details of the mountings, focusing tube, sensitometer and chronograph are also given. A. HU.

2774 522.15 : 523.78

Spectrographic observations at the total solar eclipse of 1940 October 1. I. Instrument and observational procedure. REDMAN, R. O. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *pp.* 134–139, 1942.—Successful observations of the spectra of the chromosphere and extreme limb of the Sun were made at the total solar eclipse of 1940 October 1 at Calvinia, S. Africa. Details with regard to the apparatus and observational procedure are given, together with a number of suggestions and criticisms useful as a guide for future work.

2775 523.5

The phantom Bertha mystery. HERRICK, JR., S. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 247–249, 1941.—A newspaper account of a mysterious explosion at sea is reviewed and shown to be not inconsistent with the supposition that the explosion may have been due to the fall of a contraterrene meteorite.

2776 523.51

Meteorite craters and the hypothesis of the existence of contraterrene meteorites. PAZ, L. LA. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 244–247, 1941.—Attention is called in this communication to the possibility of the existence of contraterrene meteorites, which would be just as capable of producing meteorite craters and silica-glass as are ordinary meteorites, but of which no trace would remain after collision with the Earth.

2777 523.51

Contraterrene(?) meteorites. NININGER, H. H., PAZ, L. LA. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 271–272, *and* 278–280, 1941.—The paper shows that all the phenomena referred to [see Abstr. 2776, 2786 (1942)] can be explained on the basis of demonstrated facts without assuming the existence of any such purely hypothetical material.

2778 523.51

Free copper in a new aerolite from Garnett, Kansas. NININGER, H. H. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 281–284, 1941.—The largest Cu nodule discovered in the Garnett stone has about 25 times as great an exposed surface as had the most sizable fragment reported earlier, measuring $2{\cdot}0 \times 0{\cdot}6$ mm. A chemical analysis of the Garnett stone is included.

2779 523.51

Small aerolites recovered from the site of the Holbrook, Arizona, fall of 1912. LEONARD, F. C. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 288–291, 1941.—An account of the recovery and a description of 8 aerolitic particles, ranging in wt. from 0·0628 to 0·0074 g., recently collected from ant hills at the site of the Holbrook fall of 1912. All 8 of these particles were discovered by means of alnico magnets.

2780 523.51

Metal structures in Odessa, Texas, and Canyon Diablo, Arizona, meteorites. LORD, J. O. *Contr.*

Soc. Res. Meteorites, 2, 4, *pp.* 298–305, 1941.—The features of structure commonly found in metallic meteorites are described. These include the Widmanstätten structure of the phases kamacite, taenite and plessite; the mechanical twins, or Neumann bands, strain lines, slip bands, veins and some non-metallic features, viz. schreibersite and oxide pearlite.

2781 523.531

Statistical studies of the meteoritic falls of the world as of date 1941 January 1. 2. Their areal concentration. 3. Their time distribution. LEONARD, F. C., WITH SLANIN, B. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 250–258; 262–269, *and pp.* 309–318, 1941.—The paper contains 3 tables of statistics for the meteoritic falls of (1) the U.S., (2) other countries and (3) the continents and the world (1 392 falls in all) and a brief discussion of the contents of each table.—Density of population is seen clearly to be a reason for the concentration of known meteoritic falls, while a 16th point favouring the recovery of meteorites is recognized and stated.—The paper contains a study of all the authentic meteoritic falls of the world, 1 314 in number, for which reasonably reliable information concerning the time of fall or find is available. By means of a series of tables and graphs, the following subjects are treated: (1) the observed falls by years; (2) the unobserved falls by years; (3) both kinds of falls by years; (4) the observed falls by months; and (5) the observed falls by hours. The average numbers of falls for the decade 1930–39 are compared with the corresponding numbers for the 150-year interval 1790–1939. The general increase in meteoritical activity, particularly since 1920, is apparent.

2782 523.531

Collecting small meteoritic particles. NININGER, H. H. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 258–261, 1941.—The importance of the showering of small particles associated with meteoritic falls is emphasized and some of the difficulties encountered by those who attempt to investigate the phenomenon are pointed out.

2783 523.531

A numerical designation for meteoritic falls. LEONARD, F. C. *Contr. Soc. Res. Meteorites*, 2, 4, *p.* 270, 1941.—It is proposed that a numerical designation, devised to give *per se* the long. and the lat. of the fall, be employed in conjunction with the geographical designation.

2784 523.531

An unprecedented frequency of large meteors. NININGER, H. H. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 305–306, 1941.—Reports Aug.–Sept., 1941.

2785 523.531

The Schertz, Guadalupe County, Texas, meteorite proved identical with Canyon Diablo, Arizona. MONNIG, O. E. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 318–320, 1941.

2786 523.531 : 519.24

Criteria for estimating the population of meteoritic showers. PAZ, L. LA. *Contr. Soc. Res. Meteorites*, 2, 4, *pp.* 235–243, 1941.—Simple criteria for estimating the population of a meteoritic shower are derived by use of the theory of probability. The formulae have been tested with satisfactory results on man-made meteoritic showers.

2787 523.746

Final relative sunspot-numbers for 1941. BRUNNER, W. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 155–157, *June*, 1942.

2788 523.746

Provisional sunspot-numbers for February to March, 1942. BRUNNER, W. *Terr. Magn. Atmos. Elect.*, 47, *p.* 114, *June*, 1942.

2789 523.746

Mean areas and heliographic latitudes of sunspots in the year 1938. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *pp.* 169–171, 1942.

See Abstr. 2944 523.746 : 550.385

See Abstr. 2799 523.752 : 523.78

2790 523.755 = 3

Zones of activity of the solar corona. WALDMEIER, M. *Z. Astrophys.*, 21, 1–2, *pp.* 85–95, 1941.—Coronagraph observations show that line emission at 5 303 Å and 6 374 Å in the corona at 40″–50″ from the Sun's limb occurs in 2 active zones. The principal zone coincides with the sunspot zone and shows the same temporal migration in heliographic latitude. A zone of secondary activity at latitude 63° seems unconnected with any other solar phenomenon. The most intense streamers are concentrated entirely in the spot and facula zones and show no relation to prominences. In this respect their behaviour is exactly opposite to that of the outer coronal streamers observed in integrated light at total eclipses. A. HU.

2791 523.755 = 3

Heliographic maps of the solar corona. WALDMEIER, M. *Z. Astrophys.*, 21, 3, *pp.* 109–119, 1942.—From daily coronagraph observations at the Sun's limb, the author builds up heliographic diagrams showing the intensity distribution of the coronal lines 5 303 Å and 6 374 Å over the solar disc. Agreement between the maps corresponding to the 2 lines is good in general except for regions where local high excitation of the green or of the red line upsets the normal proportionality between their intensities. Comparison with synoptic maps of the photosphere and chromosphere shows that the regions of max. line intensity in the principal zone of the corona coincide with the facular regions; the correspondence is particularly close with photospheric faculae which include sunspots and with chromospheric flocculi which are abnormally intense. No relation is found between line intensity and prominences or filaments. The secondary max. in the 60° zone shows no connection with any photospheric or chromospheric phenomena. A. HU.

2792 523.755 = 3

Radial distribution of brightness in the solar corona in the light of the 5 303 Å line. WALDMEIER, M. *Z. Astrophys.*, 21, 3, *pp.* 120–129, 1942.—The radial variation of intensity of the coronal green line is measured along an intense streamer between 51″ and 3′ 38″ from the Sun's limb. Beyond 1′ 47″ the intensity falls off much more rapidly than does that of the continuum observed at solar eclipses. This high intensity gradient is characteristic of intense streamers and is accompanied by a similar large variation parallel to the limb in the inner corona. The half-breadth of the line decreases from 1·08 Å near the limb to

0·56 Å at 3′ 38″, the corresponding turbulent velocities being 37 km./sec. and 19 km./sec. Reasons are given for believing that the main anomalies of the corona, its low radial density gradient, the strong turbulence shown by the widths of the coronal lines, and the superexcitation necessary for producing them, are all effects of the same underlying cause. A. HU.

2793 523.76 : 537.564

Note on the ionization in the hydrogen convection zone. SCHWARZSCHILD, M. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *pp.* 152–153, 1942.—The effect of collision ionization in bringing about ionization equilibrium in the convection zone is calculated. It is found that (unlike photo-ionization) it operates sufficiently rapidly to produce a quasi-equilibrium degree of H ionization in the lower part of the zone [see Abstr. 2018 (1941)].

2794 523.76 : 537.564

Conditions in the hydrogen convection zone. EDDINGTON, A. S. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *pp.* 154–158, 1942.—The conditions in the H convection zone are reconsidered in the light of Schwarzschild's results, which show that the deviation from ionization equilibrium is smaller than the author had supposed [Abstr. 2018 (1941)]. It is concluded that 2 of the principal results of the earlier paper remain true, though they come about in a different way. These are: (*a*) a large difference in the state of ionization of the upward and downward streams, with the result that the upward stream carries ionized H to the top of the convection zone where its recombination produces an excess of h.f. radiation in the outer layers; (*b*) the convection zone extends much deeper into the star than the elementary calculations (Unsöld's model) had indicated. The latter result leads to a simple explanation of the phase retardation in Cepheid variables.

2795 523.775.1

Flash spectrum photographed with high dispersion. KIESS, C. C. *Nat. Geogr. Soc., Contrib. Techn. Pap., Solar Eclipse Ser., No.* 2, *pp.* 20–47, 1942.—A single spectrogram obtained at Patos, Brazil, through a break in the cloud at third contact during the 1940 eclipse shows an emission spectrum superposed on an overexposed Fraunhofer spectrum. The spectrograph used was designed to record the range 3 000–5 500 Å [see Abstr. 2773 (1942)], another instrument for longer wavelengths failing to operate owing to a faulty switch. Wavelengths, eye-intensities and characters, origins and term combinations, are given for nearly 1 100 chromospheric lines in the region 3 227–5 398 Å. The Balmer series is traced to H_{27}, but He II 4 686 Å is not present. A. HU.

2796 523.775.1

Spectral energy distribution of the standard comparison lamp used in evaluating flash spectrum of the solar eclipse of 1940. STAIR, R., AND COBLENTZ, W. W. *Nat. Geogr. Soc., Contrib. Techn. Pap., Solar Eclipse Ser., No.* 2, *pp.* 48–52, 1942.—The standard tungsten ribbon lamp used in calibrating the flash spectrum obtained during the 1940 eclipse [see Abstr. 2795 (1942)] is described. The distribution of radiant power in its spectrum as formed by the apparatus used at the eclipse is measured at 100 Å intervals in the region 3 450–5 350 Å by means of a photocell which is itself calibrated against a thermopile. The results differ widely from calculated values based on the spectral emissivity of tungsten at the operating temperature (2 917°K.), probably owing to the fact that the absorption in the apparatus is determined more by the shapes of the rulings on the grating than by the spectral reflecting power of the speculum on which the rulings were made. A. HU.

2797 523.775.1

Intensities in the flash spectrum. KIESS, C. C., AND HUMPHREYS, C. J. *Nat. Geogr. Soc., Contrib. Techn. Pap., Solar Eclipse Ser., No.* 2, *pp.* 53–65, 1942.—The flash spectrum obtained in Brazil at the 1940 eclipse is examined microphotometrically with the aid of intensity marks from a std. lamp [see Abstr. 2796 (1942)]. Intensity measurements are made on the following chromospheric emission lines: the *b* triplet of Mg I, the *H* and *K* lines of Ca II, and the Balmer lines from Hβ to Hϕ. The observed Balmer decrement agrees fairly well with the absorption-excitation theory from Hγ to Hη (Hδ being abnormally weak) and very well with the recombination theory from Hθ to Hϕ. A. HU.

2798 523.78

Contact-times of total solar eclipse of Oct. 1, 1940, determined from photographs of the partial phases. MCNALLY, P. A. *Nat. Geogr. Soc., Contrib. Techn. Pap., Solar Eclipse Ser., No.* 2, *pp.* 66–77, 1942.—Nearly ½ of a proposed series of 260 exposures near the contact times were unrecorded because of intermittent cloud; and only a few of the 132 images secured were within a min. of the time of contact. Details are given of the observations and their reduction, and a table shows the resulting systems of correction to ephemeris mean anomalies of the sun and moon. A. HU.

See Abstr. 2774 523.78 : 522.15

2799 523.78 : 523.752

Spectrographic observations at the total solar eclipse of 1940 October 1. II. Concerning the flash spectrum and atomic velocities in the chromosphere. REDMAN, R. O. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *pp.* 140–151, 1942.—A first instalment is given of results relating to the chromospheric spectrum, from photographs obtained at the 1940 total solar eclipse. There is no detectable general wavelength displacement between emission and absorption lines near the Sun's limb. Comparison of 328 emission with 159 absorption lines gave a mean shift, absorption minus emission, of $-0{\cdot}0007 \pm 0{\cdot}002$ Å. The profiles of a selected number of chromospheric lines have been measured. Making allowance for instrumental distortion, which was measured by photographing the Kr spectrum, average atom. vel. in the line of sight were found which varied between 13·5 km./sec. for H and 1·6 km./sec. for La. The distribution of velocities with respect to atom. wt., and also the shapes of the H lines, are consistent with a kinetic temperature 35 000°K. There is probably a small systematic error in the widths of the measured profiles. Correction for this reduces the temperature to about 30 000°K. At the two places observed, on opposite sides of the Sun, there was no turbulent motion (other

than motion of a thermal nature) exceeding about 1 km./sec. in the line of sight.

2800 523.78 : 551.510.535 : 621.396.812.5

Radio observations of the ionosphere. GILLILAND, T. R. *Nat. Geogr. Soc., Contrib. Techn. Pap., Solar Eclipse Ser., No.* 2, *pp.* 88–95, 1942.—Critical-frequency radio-echo observations made during the 1940 eclipse at Patos, Brazil, indicate decreases in the ion density of the E and F_1 layers to 22% of normal within 1 or 2 min. of second contact, and of F_2 to 50% of normal about 1 hr. after the eclipse max. Recombination coefficients are estimated, and inconsistencies in the values obtained are discussed. A decrease in ion density occurred as the moon obscured a large sunspot. An unexplained rise of ion density in the E and F_1 layers 2 or 3 min. before third contact is discussed. A. HU.

2801 523.78 : 551.593.55

Sky brightness at Patos, Brazil, during twilight and during the total solar eclipse of Oct. 1, 1940. HULBURT, E. O. *Nat. Geogr. Soc., Contrib. Techn. Pap., Solar Eclipse Ser., No.* 2, *pp.* 78–87, 1942.—From measurements with a Macbeth illuminometer of the brightness of the zenith twilight sky, the temperature of the atmosphere during morning and evening twilight is found to be 218° ± 15° K. for all altitudes between 20 and 60 km. Similar measurements made during the eclipse on the temperature of the upper air immediately following its illumination by full sunlight failed because of cloud. During the first half of totality the skylight was due to secondary scattering by atmospheric particles below 20 km.; at mid-totality it was due mostly to the horizon glow. A. HU.

2802 523.872

Some recent changes in the spectrum of γ Cassiopeiae. PEACHEY, E. M. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *pp.* 166–168, 1942.—During the summer and autumn of 1940, while the spectrum of γ Cassiopeiae was devoid of conspicuous bright lines, a number of spectra of this star were obtained showing changes of a rapid and irregular nature in the appearance of some of the lines of H and neutral He. These changes are described and illustrated by a plate showing some of the spectra. The mean wavelengths of 7 of the principal lines are given with their probable errors.

2803 523.99

Observations of occultations at Sydney Observatory during 1941. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *p.* 172, 1942.

2804 523.991.2

Occultations of stars by the moon observed at the Nizamiah Observatory, Hyderabad, during the year 1941. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *pp.* 173–174, 1942.

PHYSICS: GENERAL

2805 53.087.52 : 621.317.715

An extended-range galvanometer-deflection recording system. PFISTER, R. J., AND RANK, D. H. *J. Opt. Soc. Amer.*, 32, *pp.* 397–399, *July*, 1942.—[Abstr. 1528 B (1942)].

2806 530.12

Is space-time flat? BAND, W. *Phys. Rev.*, 61, *pp.* 698–701, *June* 1 *and* 15, 1942.—Lorentz transformations are developed between relatively accelerated systems, based on the assumption that there exists an inertial set defining absolute acceleration and on the supposition that the accelerated observer uses at each moment the member of this inertial set appropriate to his momentary velocity. The application of this transformation to a planetary observer shows that the system is non-affine; beyond a critical distance events occur in reverse order during half the year and stretch through longer than normal times in the opposite season. Rosen's method [Abstr. 640 (1940)] is discussed, and shown still to require the existence of an abs. std. of uniformity of motion before the real field theory of gravitation can be maintained.

2807 530.12

Comparison spaces in general relativity. BAND, W. *Phys. Rev.*, 61, *pp.* 702–707, *June* 1 *and* 15, 1942.—A physical interpretation is given of the mathematical theorem that a Riemannian space can be defined by means of the system of local tangent flat spaces. This leads naturally to an elucidation of the status of Rosen's flat space in the general relativity theory. It is shown that the formal simplifications achieved by introducing the comparison metric do not depend on its flatness. A de Sitter type of isotropic empty space is introduced, by means of which the distribution and laws of motion of matter can be expressed in terms of the differences between actual space containing matter and the empty comparison space. Comparison spaces in general are essentially ideal, and can be introduced to bring out the non-ideal characteristics of actual space.

2808 530.12

Matter waves and electricity. LANCZOS, C. *Phys. Rev.*, 61, *pp.* 713–720, *June* 1 *and* 15, 1942.—Classical 4-dimensional relativity gives a most natural and harmonious interpretation of the 3 basic phenomena of nature: gravity, electricity and the wave structure of matter, provided that the basic assumptions of the Einstein theory are modified in 2 respects: (1) the fundamental invariant of the action principle is chosen as a quadratic instead of a linear function of the curvature components; (2) the static equilibrium of the world is replaced by a dynamic equilibrium. Electricity comes out as a second-order resonance effect of the matter waves. The matter waves are gravitational waves but superposed not on an empty Euclidean space but on a space of high average curvature.

2809 530.12 : 530.145 = 6

The relations between quantities in mechanics and in wave theory. WÜRSCHMIDT, J. *Rev. Univ. Tucumán A*, 2, *pp.* 79–85, *Dec.*, 1941.—The relativistic formula connecting mass and velocity, and the fundamental relations of quantum radiation theory, are compared and discussed.

See Abstr. 2875 530.12 : 537.13

See Abstr. 2809 530.145 : 530.12

2810 530.19 : 621.385.833

Calculation of axially symmetric fields. BERTRAM, S. *J. Appl. Phys.*, 13, *pp.* 496–502, *Aug.*, 1942.—A practical method is developed for calculating the distribution of scalar fields in axially symmetric systems. To obtain a complete solution a knowledge of the potential distribution along a cylinder of constant radius is required; in many cases the distribution

along the cylinder can be estimated with sufficient accuracy by an inspection of the electrode configuration. In particular, the potential distribution of a simple electron lens consisting of 2 co-axial cylindrical electrodes of equal dia. is expressed in terms of tabulated functions. The calculated equi-potential lines for one such case are compared graphically with a plot made in an electrolytic plotting tank.

2811 531.224.4 : 518.3 = 3

On the design of wooden struts by means of nomograms. YLINEN, A. *Schweiz. Bauztg*, 119, *pp.* 85–87, *Feb.* 21, 1942.—Formulae are deduced giving the dimensions of wooden struts capable of supporting a certain load, the struts being either hinged or fixed at the ends. The formulae have been converted into the form of nomograms to facilitate the determination of suitable cross-section dimensions of struts to withstand loads ranging from 50 to 100 000 kg. and with factors of safety of 4 or 5. Separate nomograms are given for circular and rectangular cross-sections and the diagrams are based on the mechanical properties of a typical pine-wood. A. C. W.

2812 531.225

The torsion of a prism with cross section the inverse of an ellipse. HIGGINS, T. J. *J. Appl. Phys.*, 13, *pp.* 457–459, *July*, 1942.—Saint-Venant's torsion problem is solved for the linear prism with right cross-section bounded by the curve, an inverse of an ellipse with respect to its centre. Explicit formulae are obtained for the torsion, conjugate-torsion, and complex torsion functions; for the twisting moment; for the stress function and the components of shearing stress.

2813 531.391

Theory of vehicle suspensions. MERCIER, P. E. *J. Appl. Phys.*, 13, *pp.* 484–495, *Aug.*, 1942.—The theory is established on the assumption of perfect symmetry and of a linear dependence between elastic forces and the displacements of the wheels and deflections of the tyres. The path of the vehicle rolling on uneven ground is supposed nearly straight. The rel. magnitude of the 7 vibrations corresponding to bobbing, rolling and pitching motions of the body and to the 4 sp. vibrations of the wheels, are discussed.

2814 531.52

Human trajectories. OLDENBURGER, R. *J. Appl. Phys.*, 13, *pp.* 460-469, *July*, 1942.—It is proved that a human being M falling from a ledge A through the air to the ground below will attain the greatest range if M falls forward while standing upright. If M was found on the ground at a position B beyond this range of fall, M furnished energy himself to attain B. An analysis of trajectories from A to the ground, due to an effort on the part of M, is given. If the kinetic energy which M must produce to reach B is much greater than that which M can furnish after loss of balance, M made the trip from A to B by a premeditated jump. Such analyses are important for determining suicides.

2815 531.66 : 621.315 : 517.432.1

The operational theory of longitudinal impact. PIPES, L. A. *J. Appl. Phys.*, 13, *pp.* 503–511, *Aug.*, 1942.—The differential equations governing the longitudinal displacement and velocity of a uniform rod are identical to those governing the propagation of charge and current along a uniform electrical transmission line. By this analogy well-known results of electrical circuit theory may be translated to mechanical terms.

2816 531.714.7 : 621.317.49

A note on electromagnetic induction micrometers, including a novel circuit, incorporating metal rectifiers. COX, R. J. *J. Sci. Instrum.*, 19, *pp.* 117–120, *Aug.*, 1942.—[Abstr. 1526 B (1942)].

See Abstr. 2931 531.733 : 542.3

See Abstr. 2928 531.754 : 539.26 : 541.23

2817 531.78 : 621.93

Cutting resistance of shaped diamond tools. *Gemmologist*, 12, *pp.* 43–44, *Aug.*, 1942.—A brief and undetailed account of a tool-pressure indicator using an inductance bridge to show by unbalance a small movement of the cutter. After calibration the cutting force may be plotted against cutting speed and the optimum conditions of use found. E. H. W. B.

See Abstr. 2832 532.133 : 532.77

2818 532.133 : 536.423.15

Viscosity of naphtha-resin solutions. MCARDLE, E. H., AND BALDESCHWIELER, E. L. *Industr. Engng Chem.*, 34, *pp.* 882–885, *July*, 1942.—A variation of a few deg. in the average b.p. of a given thinner produces critically large changes in resin solution viscosity.

2819 532.522 : 627.8

Reservoirs under hydraulic and volumetric control. NISSAN, A. H. *J. Inst. Petrol.*, 28, *pp.* 146–157, *July*, 1942.—Examination of the two methods for deriving the velocity/pressure relationship, for reservoirs under volumetric or hydraulic controls, shows that the assumption made in applying only orifice equations to the problem are unjustifiable. If a truly representative model is constructed the anomaly disappears and, instead of the equations $Ve = KP^{\frac{1}{2}}$ and $Ve = KP$, a single equation results: $Ve = K_1P_1 + K_2P_2^{\frac{1}{2}}$. It is shown that P_2 is negligible in oil reservoirs under volumetric or hydraulic controls and the equation then becomes $Ve = KP$. R. S. R.

2820 532.525 : 621.176

A simple air ejector. KEENAN, J. H., AND NEUMANN, E. P. *J. Appl. Mech.*, 9, *A*76–*A*81, *June*, 1942.—[Abstr. 1465 B (1942)].

2821 532.54

Pressure drop in the flow of compressible fluids. LOBO, W. E., FRIEND, L., AND SKAPERDAS, G. T. *Industr. Engng Chem.*, 34, *pp.* 821–823, *July*, 1942.—A formula including the effect of kinetic-energy changes, which can be solved readily by means of a simple chart, is presented. Use of the formula and chart is illustrated, and the results obtained are compared with those from other methods.

2822 532.59 = 3

On the theory of the cylindrical and spherical waves in frictionless gases and liquids. MARX, H. *Ann. Phys., Lpz.*, 41, 1, *pp.* 61–88, 1942.—An examination of those solutions given by Bechert [Abstr. 1425 (1941)] of the hydrodynamic equations for cylindrical and spherical waves in frictionless gases and liquids in which the density ρ depends solely on the flow velocity and the equation of state $p = p_0 + (a^2s^n)/n$ holds (p = pressure, p_0, a and n are const.), together with a determination of their physical utility. H. G. S.

2823 532.61.08

Reproducible contact angles on reproducible metal surfaces. II. Interfacial contact angles between water and organic liquids on surfaces of silver and gold. III. Contact angles of saturated aqueous solutions of different organic liquids on silver and gold. BARTELL, F. E., AND CARDWELL, P. H. *J. Amer. Chem. Soc.*, 64, *pp.* 1530–1534 *and* 1641–1643, *July*, 1942.—With the apparatus described previously [Abstr. 2042 (1942)] interfacial contact angles were measured for water drops on silver and on gold immersed in organic liquids and for organic liquid drops on these solids immersed in water. For each of the solid/organic-liquid/water systems it was possible to produce 2 stable and reproducible interfacial contact angles. These have been designated as "stable advancing" and "stable receding" interfacial contact angles. The existence of 2 different stable interfacial contact angles for a given system is explained by the theory that the solid surfaces, or interfaces, contiguous to the fluid phases become altered through adsorption from the fluids or by formation of condensed layers of fluid upon the surfaces. The experimental evidence obtained supports this view. The measurements indicate that the metal surfaces adsorb air and also organic liquid both from air and from aqueous solution. A drop of solution caused to advance by stages over a fresh metal surface gives a different angle each time it is advanced, because of evaporation of organic liquid into the air and subsequent adsorption of the vapour on the exposed metal.

See Abstr. 2926 532.612 : 541.182.63

2824 532.613.4

Equilibria in partially miscible liquids. ANTONOFF, G., CHANIN, M., AND HECHT, M. *J. Phys. Chem.*, 46, *pp.* 492–496, *April*, 1942.—[See Abstr. 1456 (1941)]. Experimental data indicate that the systems described all approach equilibrium after a certain time, when the values for the observed and calculated interfacial tensions agree. This time may vary according to the previous history and the temperature of the experiment. Rapid and abrupt changes in the density of both layers are noted. It was found that in certain systems the equilibrium can never be reached at all. This is due to some irreversible reactions which may accompany the process.

2825 532.613.4

On the validity of Antonoff's rule. ANTONOFF, G. *J. Phys. Chem.*, 46, *pp.* 497–499, *April*, 1942.—Any deviations from Antonoff's rule observed by various authors can be completely eliminated, if the system is brought into a state of equilibrium. The phenomena which cause the deviations are due to some reversible changes taking place within the liquids.

See Abstr. 2936 532.614.2 : 536.658 : 539.11 : 548

2826 532.62

The stability of multimolecular films of hydrocarbon oils, containing spreaders, on water surfaces. HEYMANN, E., AND YOFFE, A. *Trans. Faraday Soc.*, 38, *pp.* 408–417, *Sept.*, 1942.—Simple amphipathic spreaders, e.g. fatty acids and alcohols, cause rapid spreading of oils in which they are dissolved, followed by contraction to lenses of oil and a unilayer of spreader on the water surface. Measurements of surface and interfacial tensions show the final spreading coeff. to be negative in all these cases when the initial thick spread film contracts. Similar spreading and contraction occur also on $CaCl_2$ solutions. Polymerized spreaders form much more stable thick films of oils, lasting in some cases up to 18 months if kept free from dust. The interfacial films are rigid with these spreaders, and it is probable that the stability is due to resistance of these rigid films to contraction. The final spreading coeff. were sometimes zero, occasionally negative; it seems likely that the rigid interfacial films can render a thermodynamically metastable film permanent. Dyestuffs dissolved in the water can cause oils to spread to stable thick films.

2827 532.62

The pressure/area/temperature and energy relations of monolayers of octadecanenitrile. COPELAND, L. E., AND HARKINS, W. D. *J. Amer. Chem. Soc.*, 64, *pp.* 1601–1603, *July*, 1942.—In monolayers of *n*-octadecane nitrile H bonding in the film itself is no longer possible, and it was found that the min. area at any temperature and pressure was 25·8 sq. Å at 15·1° and 18 dyne $cm.^{-1}$. Thus the —C≡N end group gives much less condensed films than either the —COOH or the —OH groups. The pressure/area curves for the intermediate phase are steeper than those for the long-chain acids. The pressure/area curves for the expanded phase fall to l.p. at those areas characteristic of the liquid expanded state, so these films are not gaseous.

See Abstr. 2871 532.62 : 536.659 : 536.775

See Abstr. 2872 532.62 : 541.183.1 : 536.659 : 536.775

2828 532.71

The swelling of cellulose acetate in aqueous phenol solutions. MARSDEN, R. J. B., AND URQUHART, A. R. *J. Text. Inst., Manchr*, 33, *T*105–*T*136, *July*, 1942.—The more fundamental aspects of the swelling action of aqueous phenol solutions on cellulose acetate have been investigated. This swelling involves the uptake of both phenol and water molecules by the acetate, the phenol being absorbed in amount greatly in excess of that corresponding to its conc. in the aqueous solution, the amounts depending on the time of immersion, the conc. and temperature. Whereas the uptake of water is influenced by electrolytes, that of phenol is substantially independent of this factor. The reason why aqueous phenol solutions should act at all as swelling agents has been considered and explained on the basis of a linkage by H bonds of the hydroxyl group of the phenol to one of the O atoms in the ester group of the acetate. The paper includes a description of experimental methods with numerous tables and diagrams, and 39 references. In the discussion of the data, four main topics are dealt with viz. (1) The cause of swelling by phenol. (2) The occurrence of max. swelling between 30° and 40°. (3) The effect of electrolytes. (4) The development of translucence. H. H. HO.

2829 532.713 : 541.132

The activity coefficients of some bivalent metal nitrates in aqueous solution at 25° from isopiestic vapour pressure measurements. ROBINSON, R. A.,

WILSON, J. M., AND AYLING, H. S. *J. Amer. Chem. Soc.*, 64, *pp.* 1469–1471, *June*, 1942.—Osmotic and activity coeff. were determined from isopiestic measurements on Mg, Sr, Ba, uranyl, Co, Cu and Cd nitrates.

2830 532.72 = 3

Diffusion and hydration of the ions of Cu(II) and Ni in aqueous, acid, neutral and ammoniacal solutions. JANDER, G., AND MÖHR, H. *Z. phys. Chem. A*, 190, *pp.* 81–100, *Jan.*, 1942.—The diffusion coeff. of Cu and Ni salt solutions at different *p*H values were investigated and found to be const. for the whole range of *p*H. The distribution of the cations remains monomolecular and no tendency to form aggregates was established. The diffusion of Cu and Ni salts containing ions of Cu-tetrammine and Ni-hexammine, respectively, is much faster in ammoniacal than in aq., acid or neutral solutions. Under certain conditions the degree of hydration of the Cu and Ni ions in aq. solutions may be calculated from the diffusion coeff. found by experiment. If HCl or chlorides of high solubility are added to some of the $CuCl_2$ solutions, a change takes place from a cationic aquo- to an anionic chloro-complex. This change is accompanied by a rise of diffusibility and a change of colour. R. N.

2831 532.77

Discontinuities in properties of liquid systems. ANTONOFF, G., CHANIN, M., AND HECHT, M. *J. Phys. Chem.*, 46, *pp.* 486–491, *April*, 1942.—The experiments described indicate that some physical properties (such as density, viscosity and refr. index) of solutions of isobutyric acid change discontinuously as a function of conc. exhibiting sharp variations at some intervals. The actual position of these variations may vary according to the previous history of the solution. The density/conc. curve of dilute phenol solutions (0 to 1% by wt.) shows a marked deviation in the region of 0·5 per cent. This change is confirmed by density/time curves of 5 dilute phenol solutions ranging in conc. from 0·4 to 0·6%.

2832 532.77 : 532.133

The effect of temperature and solvent type on the intrinsic viscosity of high-polymer solutions. ALFREY, T., BARTOVICS, A., AND MARK, H. *J. Amer. Chem. Soc.*, 64, *pp.* 1557–1560, *July*, 1942.—The sp. viscosity of a dilute solution of polystyrene or rubber is strongly dependent upon the nature of the solvent; it is high in a good solvent, and low in a poor solvent or a solvent–non-solvent mixture. This has been interpreted as being due to changes in mean mol. shape. The effect of a temperature increase is to lower the sp. viscosity of rubber or polystyrene solutions in a good solvent.

2833 533.6.08 : 621.317.39.082.61 = 3

Hot-wire measurement method. DÄTWYLER, G. *Helv. Phys. Acta*, 15, 3, *pp.* 266–272, 1942.—[Abstr. 1524 B (1942)].

SOUND. VIBRATIONS

2834 534.11 : 622.67

The safety factor of winding ropes in deep shafts. BEAN, D. R. *Engineer, Lond.*, 174, *pp.* 119–120, *Aug.* 7, 1942.—[Abstr. 1578 B (1942)].

2835 534.143

An absolute pressure generator and its application to the free-field calibration of a microphone. KENNEDY, W. J., AND BONER, C. P. *J. Acoust. Soc. Amer.*, 14, *pp.* 19–23, *July*, 1942.—A device for producing a known pressure at designated points in a progressive plane sound wave is described. The method of using this abs. pressure generator to effect the free-field calibration of a velocity microphone over a limited frequency range is outlined, and the results compared with a Rayleigh-disc calibration. Suggestions are given for extending the range over which the generator can be used as a microphone calibrating agency.

2836 534.26

The translational dispersion of sound in gases. PRIMAKOFF, H. *J. Acoust. Soc. Amer.*, 14, *pp.* 14–18, *July*, 1942.—The translational dispersion is discussed from the standpoint of kinetic theory. An explicit relation is derived for the variation of sound velocity with frequency in monatomic gases: $V = V_0(1 - 5{\cdot}4l^2/\lambda^2)$, where l is the m.f.p. and λ the wavelength. The possibility of experimental observation of translational dispersion is briefly discussed.

2837 534.415 : 621.385.832

The c.r. tube used stroboscopically. BOCKING, G. *Electronic Engng*, 15, *pp.* 102–103, *Aug.*, 1942.—[Abstr. 1546 B (1942)].

2838 534.611

Sound power density fields. ENNS, J. H., AND FIRESTONE, F. A. *J. Acoust. Soc. Amer.*, 14, *pp.* 24–31, *July*, 1942.—A graphical presentation of the streaming of acoustical energy near vibrating radiators and reflecting surfaces is developed. The sound power density field from a simple source, a doublet source, a single point source before a totally reflecting plane (free as well as rigid), and a piston vibrating in an infinite fixed wall, is considered analytically. Formulae are worked out for computation of percent of total radiation flowing through a certain area. By interpolation of the graphs from these equations, the flow of energy for the several radiation fields is shown.

2839 534.843

Perturbation of sound waves in irregular rooms. BOLT, R. H., FESHBACH, H., AND CLOGSTON, A. M. *J. Acoust. Soc. Amer.*, 14, *pp.* 65–73, *July*, 1942.—The boundary perturbation theory is applied to the solution of certain problems in room acoustics. Wave patterns and normal frequencies can be calculated for rooms having walls distorted by shape irregularities, by non-uniformities of boundary absorption, or by a combination of these. Specific formulae are derived for trapezoidal shapes and calculations agree with experimental patterns and frequencies reported previously. An experiment has been devised to test the range of validity of the perturbation formulae for one case.

2840 534.85 : 621.396.625

A discussion of several factors contributing to good recording. LYNN, R. A. *RCA Rev.* [*Radio Corp. Amer.*], 6, *pp.* 463–472, *April*, 1942.—[Abstr. 1559 B (1942)].

2841 534.861.1 : 621.396.712.3 = 4

Acoustics of broadcasting studios. FURRER, W. *Bull. Ass. Suisse Élect.*, 33, *pp.* 305–310, *June* 3, 1942.—[Abstr. 1565 B (1942)].

2842 534.861.1 : 621.396.712.3 = 3

Acoustics of broadcasting studios. FURRER, W. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 77–85, *March*; 99–109, *April, and pp.* 143–152, *May*, 1942.—[Abstr. 1564 B (1942)].

OPTICS

2843 535.241.1

System of photometric concepts. MOON, P. *J. Opt. Soc. Amer.*, 32, *pp.* 348–362, *June*, 1942.—The system of photometric nomenclature and definitions at present in use is unsatisfactory and illogical. The author proposes a fresh system based on 6 concepts, viz. flux, flux density, flux density per unit solid angle, flux density per unit solid angle per unit thickness of source (for diffusing media and volume sources), flux-time, flux-density-time. Names, derived on a systematic plan, are proposed for the various quantities and their units. The concluding section of the paper contains a brief treatment of photometric calculation. J. W. T. W.

2844 535.245

Brightness and brightness meters. TAYLOR, A. H. *Illum. Engng, N.Y.*, 37, *p.* 425, *July*, 1942.—Errata. [Abstr. 1519 (1942)].

2845 535.247 : 77

A precision direct reading densitometer. SWEET, M. H. *J. Opt. Soc. Amer.*, 32, *p.* 400, *July*, 1942.—The Agfa Ansco Model 11 Densitometer was designed to provide a simple and accurate objective instrument chiefly for photographic applications. The electronic amplifier is a modification of a logarithmic circuit [Abstr. 2432 (1929)].

See Abstr. 2857 535.247.4 : 535.375.5

2846 535.313.2

On the optical see-saw diagram. BURCH, C. R. *Mon. Not. Roy. Astr. Soc.*, 102, 3, *pp.* 159–165, 1942.—The optical see-saw diagram provides a method of describing the imaging properties of a system of centred aspheric surfaces in the extended paraxial region. The description is given in terms of the anastigmatizing plates ("Schmidt plates"), which each surface would need, if used alone, to remove its third-order errors, and of the figurings of the individual surfaces. The method is applied to the design of a "Baker" reflecting anastigmat; to an approx. anastigmatic system, and to 2 anastigmatic "singlet" lenses.

2847 535.321

Refractive-index measurements at and above the melting point of solids. FREDIANI, H. A. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 439–441, *May* 15, 1942.—A newly-developed attachment for the Fisher refractometer now extends the measurement of μ for a larger group of organic substances, with the simultaneous determination of μ and the m.p., with an approximation of the dispersion also. The apparatus described covers a range of μ of 1·300 to 1·900 to a limit of 0·002 unit and m.p. up to 200°C. with an accuracy of 1–2 deg. C. Operating technique is given, with particulars of some compounds investigated. E. H. W. B.

2848 535.323

Refractive-index values for potassium bromide. FORREST, J. W. *J. Opt. Soc. Amer.*, 32, *p.* 382, *July*, 1942.—A 60° prism of the material was prepared and its indices read on a precision spectrometer. The values obtained are shown in tables.

2849 535.33

The emission spectrum of water as observed in flames. GAYDON, A. G. *Quart. J. Roy. Met. Soc.*, 68, *pp.* 200–201, *July*, 1942.

2850 535.338.1 : 539.153

Interaction of atomic energy levels. V. SUBBARAYA, T. S., YUSUFF, S., AND MURTHY, S. S. **VI.** SUBBARAYA, T. S., SESHADRI, K., AND RAO, N. A. N. *Proc. Indian Acad. Sci.*, 15, *pp.* 244–257, *April*, 1942.—The spectra of 2 elements and of their mixture are produced under similar conditions, and the rel. intensities of the lines of each element in the spectrum of the mixture are compared with the rel. intensities of the same lines in the spectra of the individual elements. Some lines are strengthened and others are weakened. Since conditions of temperature, pressure, etc., are kept unchanged, the alterations in intensity can be ascribed to the mutual influence of the two atoms, especially through the medium of impacts of the second kind.

2851 535.342 : 541.632 = 3

Isomerism and absorption in cyclic pyrrol dyestuffs. IV. Communication on light absorption and structure of the derivatives of chlorophyll. PRUCKNER, F. *Z. phys. Chem. A*, 190, *pp.* 101–125, *Jan.*, 1942.—[See Abstr. 441 (1942)]. The effect of molecular symmetry on position and height of the red spectral band of the derivatives of chlorophyll is further investigated. For isomeric compounds the molecular symmetry is in general represented by the first and third band. This effect may be masked by the presence of chromophore groups. Therefore a separation of the different interacting factors is necessary before a given spectrum is interpreted as regards the relative position of substituents. R. N.

2852 535.343

Quantitative spectroscopic analysis of proteins. BUSWELL, A. M., AND GORE, R. C. *J. Phys. Chem.*, 46, *pp.* 575–581, *May*, 1942.—An infra-red spectroscopic procedure for the quantitative analysis of a protein is outlined. The absorption band frequencies of *l*-proline have been assigned to various active groups. The bands at 2·9, 3·0 and 3·1 are N—H frequencies; those at 3·2 and 3·3 are C—H frequencies. The spectra of arginine, arginine monohydrochloride, guanidine nitrate, guanidine carbonate and guanidine carbonate treated with HCl, are discussed. The addition of HCl to arginine and guanidine carbonate increases the N—H absorption. HNO_3 causes the disappearance of these frequencies in proline and a decrease in their intensity in guanidine. This is attributed to the destruction or masking of the N—H group. The mol. extinction coeff. of proline is so small, compared with that of arginine, that proline plays little part in the absorption spectrum of salmine.

See Abstr. 2930 535.343 : 541.124 : 541.8

2853 535.343.4 = 3

Electron band spectra of triatomic linear-unsymmetrical molecules. MÜLLER, P. *Helv. Phys. Acta*, 15, 3, *pp.* 233–258, 1942.—The band systems of the vapours of HgClBr, HgBrI, and HgClI have been investigated. The band spectra are very similar to

those of the symmetrical molecules HgX_2 (X=Cl, Br, I). Only HgClI is sufficiently unsymmetrical to give bands corresponding to vibrations of the type ←O O→ ←O. A. J. M.

2854 535.343.4 = 3

Absorption spectra of triatomic molecules in the Schumann range. MÜLLER, P., AND WEHRLI, M. *Helv. Phys. Acta*, 15, 3, *pp.* 307–310, 1942.—The ultraviolet absorption spectra of the vapours of $TeCl_2$, $TeBr_2$, HgF_2 and $Hg(CN)_2$ have been investigated. In the case of $TeCl_2$ and $TeBr_2$, 3 new electron band systems and a continuum have been found. In the case of HgF_2 a continuum appeared above 400° which receded towards longer wavelengths when the temperature was raised. At 500° a long-wave limit of 1 850 Å appeared. With $Hg(CN)_2$ at 110° a continuum between 1 800 and 1 650 Å was found. With rising temperature the short-wave limit is displaced towards shorter wavelengths. A. J. M.

2855 535.349 : 771.53

The effect of gradual light absorption in photographic exposure. SILBERSTEIN, L. *J. Opt. Soc. Amer.*, 32, *pp.* 326–331, *June*, 1942.—The effect of absorption in a thick emulsion coating upon the resultant photographic density and contrast (γ) has been treated [Abstr. 1635 (1939)] for the case of an elementary exposure law based on the quantum theory and the 1- or 2-quanta hypothesis, and for an emulsion of an exponential size-frequency distribution of its grains. The present paper treats this problem in its full generality, without specifying the form of the elementary exposure law. The paper is mathematical. A. H.

2856 535.375.5 = 3

Raman - spectroscopy: technical applications. BÉDERT, W. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 90–95, *March*, 1942.—The number, intensity and degree of polarization of the lines of the Raman spectrum give considerable information concerning the binding forces, the mass and the spatial arrangement in the molecule. Examples are given from the results of numerous investigators illustrating the use of Raman spectrograms in following the changes in industrial processes, especially those concerned with tetrahedral molecular groups. A. W.

2857 535.375.5 : 535.247.4

Photo-electric detection and intensity measurement in Raman spectra. RANK, D. H., PFISTER, R. J., AND COLEMAN, P. D. *J. Opt. Soc. Amer.*, 32, *pp.* 390–396, *July*, 1942.—Preliminary experiments on the photoelectric detection of Raman spectra are described, making use of commonly available spectroscopic equipment in conjunction with the new RCA-931 photomultiplier tube [Abstr. 1777 B (1941)]. A more elaborate experiment is described using a large plane-grating monochromator as the dispersing device. The photo-electric current was suitably amplified and continuously recorded, making use of a galvanometer and photographic galvanometer-deflection recorder. The limit of detection set by the thermionic emission at room temperature of the photomultiplier has been reached. The min. intensity observable photoelectrically compares favourably with the min. commonly observed photographically in Raman spectra. An arrangement of apparatus for quantitative spectroscopic analysis photo-electrically is suggested.

See Abstr. 2891 535.375.5 : 539.133

2858 535.375.5 : 541.57

Raman effect and hydrogen bonds. III. Acetic acid and its mixtures with water and phenol. IV. Mixtures of acetic acid with donor substances. MURTY, G. V. L. N., AND SESHADRI, T. R. *Proc. Indian Acad. Sci. A*, 15, *pp.* 230–243, *April*, 1942.—Previous work on the Raman spectrum of acetic acid and of its solutions is critically reviewed. The Raman spectra of the acid in the pure state as well as in aqueous solutions at different dilutions have been reinvestigated and the results described. The breaking-up of the ring dimers of the acid is brought about by the formation of hydrated molecules, and the formation of fresh H bonds between the acid and water molecules is the cause of this breakdown of the ring type into the open dimers and finally into hydrates of the monomeric form of the acid molecules. Changes similar to those obtained in aqueous solutions are produced in the C=O frequencies of phenol mixture. Anionoid solvents affect the molecular aggregation of acetic acid, the effect being prominent with those having strong anionoid C=O groups such as coumarin and phenyl acetate. The breakdown of the ring dimers is not complete. Definite evidence has been given for the presence of open dimers. There is justification for the view that water molecules serve also as anionoid molecules in effecting the breakdown of the ring dimers of acetic acid.

2859 535.392 : 628.9

Notes on the empirical use of colour in industry. BIRREN, F. *J. Opt. Soc. Amer.*, 32, *pp.* 400–401, *July*, 1942.—A criticism. [See Abstr. 1067 (1942)].

2860 535.514.9 : 541.18

Polarization of light scattered by isotropic opalescent media. PERRIN, F. *J. Chem. Phys.*, 10, *pp.* 415–427, *July*, 1942.—A general study is given of the polarization of light scattered by isotropic media whose elements of heterogeneity are not very small in comparison with the wavelength (suspensions, colloidal solutions, solutions of large molecules . . .). This includes an extension of a theory by Krishnan [Abstr. 2009, 2010, 3444 (1938)], who proved the equality of 2 of the 4 coeff. which are to be considered. The scattering through a given angle and for a given wavelength is characterized by the 16 coeff. of the linear forms which express the 4 polarization parameters of the scattered beam in terms of the 4 corresp. parameters of the incident beam; the law of reciprocity leads to 6 relations between these 16 coeff. The comparison with dipolar scattering by very small elements shows that the best test to prove multipolar scattering is the existence of some ellipticity in the scattered light when the incident beam is linearly polarized in a direction oblique to the scattering plane.

2861 535.563

Optical rotatory dispersion of (—)tetrahydrofurfuryl alcohol. AIRS, R. S., BALFE, M. P., IRWIN, M., AND KENYON, J. *J. Chem. Soc.*, *pp.* 531–532, *Aug.*, 1942.

2862 535.81 : 666.22

Some problems relating to optical glass. HAMPTON, W. M. *Proc. Phys. Soc., Lond.*, 54, *pp.* 391–404, *Sept.*, 1942.—In this inaugural lecture to the Optical

Group, the author deals with: (1) The difficulties of supplying glass in sufficient quantity; (2) the difficulty of the supply of raw materials of the necessary quality; (3) the effect of heat treatment on the optical properties of the glass made; (4) the question of durability. It would be of value to manufacturers if the designers would indicate precisely the type of refr.-index/dispersion relation that would be of most value to them in designing new systems. A discussion on the thermodyne test for dimming concludes the paper. H. H. HO.

2863 535.87

Simple construction of a parabolic mirror. BUBB, F. W. *J. Opt. Soc. Amer.*, 32, *p.* 400, *July*, 1942.—A suggestion for using rotating synthetic resins. [See Abstr. 804 (1909)].

HEAT. THERMODYNAMICS

See Abstr. 2818 536.423.15 : 532.133

See Abstr. 2874 536.62 : 538.22 : 536.791

See Abstr. 2899 536.653 : 539.217

2864 536.654

Heat of dissociation of cyanogen. ROBERTSON, N. C., AND PEASE, R. N. *J. Chem. Phys.*, 10, *p.* 490, *July*, 1942.—[See Abstr. 2344 (1941)].

See Abstr. 2936 536.658 : 539.11 : 532.614.2 : 548

See Abstr. 2871 536.659 : 532.62 : 536.775

See Abstr. 2872 536.659 : 541.183.1 : 532.62 : 536.775

2865 536.66

Heats of organic reactions. XII. The reaction between methemoglobin and salicylate. ROBERTS, R. M. *J. Amer. Chem. Soc.*, 64, *pp.* 1472–1475, *June*, 1942.—The heats of reaction of methemoglobin and carboxyhemoglobin with sodium salicylate at *p*H 7·3 were measured. The state of oxidation of the hemoglobin iron was without effect on the heat of reaction at a given salicylate conc. The heat of reaction of methemoglobin and sodium salicylate increased with salicylate conc. up to 0·8 *M*, the limit of the present experiments. H-bond formation between salicylate and side chains of the protein molecule may account for a part of the heat of reaction. The heats of reaction are compared with changes in the absorption spectra of carboxyhemoglobin and methemoglobin in salicylate and benzoate. The 2 effects are unrelated. Colorimetric estimation of the extent of reaction of salicylate with methemoglobin is therefore unreliable.

2866 536.71

Determination of the Lennard–Jones parameters from second virial coefficients. Tabulation of the second virial coefficient. STOCKMAYER, W. H., AND BEATTIE, J. A. *J. Chem. Phys.*, 10, *pp.* 476–477, *July*, 1942.—Values of $B/(2\pi N\sigma^3/3)$ to 4 decimal places as a function of θ/T are computed from $\theta/T = 0{\cdot}20$ to $1{\cdot}00$ for a Lennard–Jones (6, 12) potential. For methane and *n*-butane the method gave B values agreeing with observed values.

2867 536.71

The second virial coefficient for gas mixtures. BEATTIE, J. A., AND STOCKMAYER, W. H. *J. Chem. Phys.*, 10, *pp.* 473–476, *July*, 1942.—The second virial coeff. B for methane, normal butane and 3 mixtures of these gases, were evaluated from the exp. data, and the interaction term B^{12} computed for methane-*n*-butane from 150° to 300°C. The results were used to study the methods of combination of const. in an equation of state. Computation of B^{12} from a Lennard–Jones expression similar to that used for a pure gas gave good results. This suggested a new method of combination of const. in the equation of state, which led to the best results of any method so far used.

2868 536.75 : 541.132

The determination of the entropy of the chloride ion. BERNHARDT, H. A., AND CROCKFORD, H. D. *J. Phys. Chem.*, 46, *pp.* 473–476, *April*, 1942.—The absolute entropy of the chloride ion in 6 different conc. of HCl, NH_4Cl, LiCl, NaCl, KCl, RbCl and CsCl at a mean temperature of 30°C. has been determined from data obtained with thermocells employing Ag-$AgCl_2$ electrodes.

2869 536.758 : 539.31

Statistical thermodynamics of rubber. II. WALL, F. T. *J. Chem. Phys.*, 10, *pp.* 485–488, *July*, 1942.—[See Abstr. 1308 (1942)].—The statistical theory of rubber elasticity is extended by postulating that the total volume of a piece of rubber remains const. during a stretching process. The modified theory is found to be in better agreement with observation than any previous molecular theory. In addition, it is shown theoretically that rubber should obey Hooke's law with respect to shear.

See Abstr. 2889 536.77 : 539.132

2870 536.77 : 541.8 : 541.132

The use of the h and h' functions in calculating the activity coefficients of strong electrolytes: dependence of the activity and activity coefficient on the concentration units. EVERSOLE, W. G., AND HART, T. F. *J. Phys. Chem.*, 46, *pp.* 555–561, *May*, 1942.—An equation is given for calculating the limiting value of $h/r^{1/2}$ and $h'/r^{1/2}$ at infinite dilution. The Debye–Hückel limiting slopes of the curves $h'/r^{1/2}$ *v.* $r^{1/2}$ and $h/r^{1/2}$ *v.* $r^{1/2}$ are zero and $\frac{1}{2}$, respectively. [See Abstr. 1419 and 1420 (1940)].

2871 536.775 : 532.62 : 536.659

Surface fugacity and the heat of free expansion on a surface for a single-component insoluble film. INNES, W. B., AND ROWLEY, H. H. *J. Phys. Chem.*, 46, *pp.* 548–554, *May*, 1942.—Surface fugacities and heats of 2-dimensional free expansion have been evaluated as a $f(F)$ and also as a $f(\theta)$ for data obeying a 2-dimensional van der Waals equation (attraction term neglected) as well as the Langmuir adsorption equation. The 3-dimensional pressure is shown to be $\propto$ the surface fugacity, and the proportionality const. has been evaluated.

2872 536.775 : 532.62 : 541.183.1 : 536.659

Equilibria of two-dimensional systems. I. ROWLEY, H. H., AND INNES, W. B. *J. Phys. Chem.*, 46, *pp.* 537–548, *May*, 1942.—Surface heat content, surface free energy and surface fugacity, are defined. Equilibria between insoluble 2-dimensional films and external 3-dimensional phases are treated in general, with the conclusions that the surface-phase chemical potentials are equal to the external-phase chemical potentials for the different components, but that the phase rule governing equilibria of this type must be

modified to read $V = C - P + 3$. Equilibria between a gas phase and an insoluble surface phase for a single-component system are treated in detail, giving relationships involving the differential and integral entropy of adsorption, the differential and integral heats of adsorption, and the reversible work of adsorption.

2873 536.775 : 537.361

The thermodynamic theory of electrocapillarity. GRAHAME, D. C., AND WHITNEY, R. B. *J. Amer. Chem. Soc.*, 64, *pp.* 1548–1552, *July*, 1942.—The thermodynamic equations of electrocapillarity are derived with no assumptions other than that of equilibrium between the phases. The interpretation of the equations so obtained is slightly different from what had previously been supposed. A general electro-capillary equation is derived for a non-polarized electrode, and it is shown how this may be applied to experimentally obtainable data.

See Abstr. 2923 536.775 : 541.18

2874 536.791 : 538.22 : 536.62

Magnetism and the third law of thermodynamics. The heat capacity of manganous fluoride from 13° to 320°K. STOUT, J. W., AND ADAMS, H. E. *J. Amer. Chem. Soc.*, 64, *pp.* 1535–1538, *July*, 1942.—There is a max. in the heat-capacity curve, due to the changing distribution of the magnetic manganous ions among the available energy states, at 66·5°K. The entropy calculated from the heat-capacity measurements is 22·25 cal. deg.$^{-1}$ mole^{-1} at 298·16°K.

ELECTRICITY. MAGNETISM

2875 537.13 : 530.12 = 3

Addendum to: Is the Dirac theory of the positron Lorentz-invariant? HÖNL, H. *Phys. Z.*, 42, 15–16, *pp.* 294–295, *Sept.*, 1941.—[See Abstr. 1655 (1941)].
H. G. S.

See Abstr. 2909 537.2 : 541.127

See Abstr. 2925 537.213 : 541.182.6

2876 537.226.3 : 621.3.017.143

Dielectric loss in paraffin-wax solutions. FRÖHLICH, H. *Proc. Phys. Soc., Lond.*, 54, *pp.* 422–428, *Sept.*, 1942.—[See Abstr. 1196 B (1941)].

See Abstr. 2924 537.228.3 : 541.18

2877 537.312.8 = 3

Galvanomagnetic investigations on the mechanism of conduction in platinum and rhodium. Connection between conductivity and texture. SCHULZE, R. *Phys. Z.*, 42, 17–18, *pp.* 297–307, *Oct.*, 1941.—The purport of the investigation is to determine whether the type of electrical construction of the transition metals of group 8 of the periodic system depends on the number of the valency electrons. In a transverse magnetic field of 40 000 gauss at the b.p. of He, the electrical resistance of both Pt and Rh increases considerably. With Rh the rise is comparatively large in the weaker fields and then becomes slower with increasing field strength, approaching saturation above 30 000 gauss. The resistance of Pt increases rapidly with the field strength up to 40 000 gauss (with $H^{1·4}$). Texture due to drawing in wire-drawn samples, the presence of which is shown by X-ray photographs, cause departure from the Kohler rule and can produce a marked effect in the transition from the longitudinal to the transverse field. For the longitudinal effect, magnetic field // direction of current, contrary to the theory of the free isotropic electron gas, Pt gives a value differing from 0, amounting at 4·2° Abs. to about ⅓ of the transverse effect. In the field-free case the electrical resistance of either metal deviates from the simple exponential law of temperature.
H. G. S.

2878 537.36

Elektrokinetic study of octadecyl alcohol: a comparison of mobility values obtained by electrophoresis and by electro-osmosis. HAM, A. J., AND DOUGLAS, H. W. *Trans. Faraday Soc.*, 38, *pp.* 404–408, *Sept.*, 1942.—An apparatus and technique is described for making electro-osmotic measurements using small amounts of a powder less dense than the aqueous medium employed. The expression $\frac{u \,.\, l}{E \,.\, q}$ derived from electro-osmotic measurements remains const. while q/l varies 20-fold. $\frac{u \,.\, l}{E \,.\, q}$ for particles of a certain dia. agrees numerically with electrophoretic mobility V_o, derived for particles of 100 times smaller dia., indicating the relative unimportance of size of particle provided the colloid range is excluded.

See Abstr. 2873 537.361 : 536.775

2879 537.363

Electrophoresis of crotoxin. CHOH HAO LI AND FRAENKEL-CONRAT, H. *J. Amer. Chem. Soc.*, 64, *pp.* 1586–1588, *July*, 1942.—Crotoxin, the crystalline neurotoxin isolated from rattlesnake venom, is a homogeneous substance in electrophoresis experiments. The solutions do not exhibit the phenomenon of reversible boundary spreading to a detectable extent, in contradistinction to all other proteins studied.

2880 537.523.4 : 621.317.728 : 621.3.015.5

The electric spark in air. MEEK, J. M. *J. Instn Elect. Engrs*, 89, *Part I*, *pp.* 335–351; *Disc.*, 352–356, *Aug.*, 1942.—[Abstr. 1480 B (1942)].

2881 537.525 = 3

Theoretical and experimental contributions to the Schottky diffusion column. FETZ, H. *Ann. Phys., Lpz.*, 40, 8, *pp.* 579–600, 1941.—An investigation of the boundary problem. On the basis of the experimental evidence the ion velocity at the wall of the positive column is assumed to be preponderantly directive (towards the wall) and is introduced into the Schottky theory as a new boundary condition. This assumption leads to a relation between the ion wall velocity and the mean ion temperature of the column, and this is tested by probe measurements, in connection with which a new oscillograph method is used which enables the electron temperature, the plasma potential and the electron saturation current, to be read directly on the cathode-ray tube with considerable accuracy. A Pirani manometer is described, with which the Hg v.p. can be measured with a flame discharge so that any temperature rise due to the cathode spot can be detected. The gas temperature is calculated on the premise of a conical distribution of the current density over the cross-section. With large currents a strong magnetic effect on the cross-sectional distribution of the plasma density is indi-

cated by the probe measurements. With small currents, however, the theoretical results are well confirmed, and a highly probable connection is found between the mean ion temperature and the v.p.

H. G. S.

2882 537.533.79

Ionization and dissociation by electron impact: normal butane, isobutane and ethane. STEVENSON, D. P., AND HIPPLE, JR., J. A. *J. Amer. Chem. Soc.*, 64, *pp.* 1588–1594, *July*, 1942.—The variation of the rel. abundances of the ionic dissociation products formed by electron impact in ethane, normal butane and isobutane, are reported as a function of the energy of the bombarding electrons. The critical potentials of a number of the processes have been measured, and their significance is discussed. Certain limitations of the mass spectrometer as an analytical tool are also discussed.

See Abstr. 2793, 2794 537.564 : 523.76

See Abstr. 2764 537.591.1 : 539.152.1 : 517.948.34

See Abstr. 2874 538.22 : 536.62 : 536.791

2883 538.24 : 621.3.013.82 = 3

Effect of magnetic viscosity on the velocity of the variation of the magnetization of iron. TELESNIN, R. W. *J. Phys., U.S.S.R.*, 5, 4, *pp.* 213–229, 1941.—By means of the Helmholtz pendulum interruptor, times of the order of 10^{-6} sec. can be measured with an accuracy within 10%, while those of 10^{-5} sec. can be measured to about 1%. It is found that the inductivity of the ballistic galvanometer is not const. and that this has an effect on the galvanometer calibration. With very thin iron wires the magnetization time is found to be $< 0{\cdot}5 \times 10^{-6}$ sec. The influence of viscosity on the magnetization time is found to exist for the broad portion of the hysteresis loop as far as the upper and lower bends. In the upper and lower portions of the loop where the field is strong, no viscosity effects could be observed. A very pronounced increase in the change of magnetization is found for that part of the hysteresis loop where the differential permeability is very large. This increase is shown to be due not to Foucault eddy currents, but to magnetic viscosity. A. W.

2884 538.312 : 621.315

Energy and energy flow in the electromagnetic field. SLEPIAN, J. *J. Appl. Phys.*, 13, *pp.* 512–518, *Aug.*, 1942.—[Abstr. 1502 B (1942)].

2885 538.615

Zeeman effects in the spectrum of singly ionized nickel. LINDSLEY, C. H. *J. Opt. Soc. Amer.*, 32, *pp.* 387–389, *July*, 1942.—Zeeman data for 128 Ni II lines (2 165 to 4 067 Å) are given, based on measurements of Zeeman patterns photographed at M.I.T. in magnetic fields of 85 700 and 81 300 gauss. g values have been determined for the even energy levels arising from the $3d^84s$ configurations and from some of the $3d^85s$ configurations, and for many of the odd levels arising from the $3d^84p$ configurations.

2886 538.75 : 550.38

Adjustment of the horizontal-intensity and declination variometers at the magnetic observatory, Hermanus. WIJK, A. M. VAN. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 171–172, *June*, 1942.

2887 538.75 : 550.38

Magnetic observatory, Elisabethville, Belgian Congo. HEINRICHS, G. *Terr. Magn. Atmos. Elect.*, 47, p. 174, *June*, 1942.

MOLECULAR AND ATOMIC PHYSICS

See Abstr. 2936 539.11 : 532.614.2 : 536.658 : 548

2888 539.13

Electronic structure and stability of hydrogen halides and of complex ions XO_4. FAJANS, K., AND BAUER, N. *J. Chem. Phys.*, 10, *pp.* 410–415, *July*, 1942.—In the H halide molecules (internuclear distance r_o) the proton penetrates the electronic shell of the anion to a depth such that the amount of neg. charge beyond the sphere of radius r_o equals $-1e$. From the dipole moments $\mu = xer_o$ it can be concluded that the wave-mechanical distribution of the neg. charge of the free halide ions is changed so that the c.g. of an amount of charge equal to $-(1-x)e$ is shifted from the halogen nucleus to the proton. The relatively unstable HI and ClO_4^- approach the unpolar type of binding more closely than any other of the compounds considered.

2889 539.132 : 536.77

Energy levels and thermodynamic functions for molecules with internal rotation. I. Rigid frame with attached tops. PITZER, K. S., AND GWINN, W. D. *J. Chem. Phys.*, 10, *pp.* 428–440, *July*, 1942.—A general treatment of internal rotation is given for molecules whose m. of i. for over-all rotation are independent of internal rotational co-ordinates. Tables are presented for thermodynamic functions and for the potential energy $(V/2)(1-\cos n\phi)$. Methods are suggested for treating problems where cross-terms involving more than 1 internal co-ordinate are present in the potential energy. The energy-level expressions are developed for the general case with the potential energy expressed by a Fourier series.

2890 539.133

The magnitude of the solvent effect in dipole-moment measurements. Part VI. Induced and mesomeric moments of the alkyl halides and the halogenobenzenes. AUDSLEY, A., AND GOSS, F. R. *J. Chem. Soc.*, *pp.* 497–504, *Aug.*, 1942.—The influence on the primary moment (μ_P) of alkyl radicals, known as the radical effect, is due to moments (μ_I) induced in the alkyl chains which, unlike the actual inductive effects, are not $\propto \mu_P$. This is due to a spatial effect arising from the disposal of the polarizable matter about the dipole axis which varies independently of the ratio μ_I/μ_P but can be determined simultaneously with the dipole moment by making use of the solvent-effect equation. The radical effect [Abstr. 2132 (1942)] consists of 3 parts, and the influence of the spatial effect on each of these parts varies through a series of alkyl halides in the order AlkF > AlkCl > AlkBr > AlkI. The spatial effect is negligible for the alkyl iodides, whence it is shown that the true μ_I/μ_P ratio for the tertiary halides is 0·410, and that this can be applied to analogous halogen compounds. The corrected moments for the halogenobenzenes follow the sequence PhI > PhBr > PhCl > PhF, earlier values for iodobenzene being too low owing to neglect of the solvent effect, which follows the sequence PhI >> PhBr > PhCl > PhF.

2891 539.133 : 535.375.5

Polarizibility and internuclear distance. BELL, R. P. *Trans. Faraday Soc.*, 38, *pp.* 422–429, *Sept.*, 1942.—It is shown that, owing to the anharmonicity of the zero-point vibrations, there should be a small difference between the refractivities of H and D compounds. Experimental values of this difference are used to calculate α', the variation of polarizibility with internuclear distance, for the molecules H_2, HCl, HBr and CH_4. Expressions are given for the effect of temperature upon the mean internuclear distance in diatomic molecules, and calculated values are given for H_2, HCl, HBr, N_2, O_2 and Cl_2. It is concluded that there should be a measurable change of electron polarizibility with temperature, which could be used to estimate α'. The values of α' obtained from the isotope effect are used to calculate the intensities of Raman lines for H_2, HCl, HBr and CH_4, relative to one another and to the Rayleigh scattering.

2892 539.133 : 541.54

Valence and central forces in bent symmetrical XY_2 molecules. SHAFFER, W. H., AND NEWTON, R. R. *J. Chem. Phys.*, 10, *pp.* 405–409, *July*, 1942.—Appropriate generalized co-ordinates and potential functions are set up for studying the zero- and first-order vibration problem of the bent symmetrical XY_2 molecular model under the assumption of valence and central forces. The force const. in the quadratic and cubic parts of the potential function of the water vapour molecule are evaluated for these types of forces.

2893 539.152.1 = 3

Pair theory of nuclear forces. WENTZEL, G. *Helv. Phys. Acta*, 15, 2, *pp.* 111–126, 1942.—A mathematical paper. A simplified process for the exact solution of the eigen-value problem of the electron-pair theory is given. A. J. M.

2894 539.152.1 = 3

Nuclear forces in the electron-pair theory. JAUCH, J. M. *Helv. Phys. Acta*, 15, 2, *pp.* 175–191, 1942.—The nuclear forces have been calculated in the electron-pair theory on the basis of the scalar type of coupling. Exact solutions are obtained in the case of very weak and very strong coupling. A. J. M.

2895 539.152.1 = 3

Scattering problem in the electron-pair theory. JAUCH, J. M. *Helv. Phys. Acta*, 15, 3, *pp.* 221–232, 1942.—The difficulties which make an exact treatment of coupling types involving spin impossible on the electron-pair theory are discussed on the basis of the scattering of electrons by heavy particles. The occurrence of inelastic scattering with the production of pairs is the cause of the difficulties. The effective cross-section of this scattering process is obtained. A. J. M.

See Abstr. 2764 539.152.1 : 537.591.1 : 517.948.34

See Abstr. 2850 539.153 : 535.338.1

2896 539.155.2 : 541.135

Efficiency of the electrolytic separation of chlorine isotopes. JOHNSTON, H. L., AND HUTCHISON, D. A. *J. Chem. Phys.*, 10, *pp.* 469–472, *July*, 1942.—The electrolytic separation coeff. has been determined for the Cl isotope separation in the electrolysis of NaCl solutions at a Pt anode. Flotation of purified NaCl crystals in ethylene dibromide was employed as the analytical procedure in determining the isotopic composition of samples. Densities of the ethylene dibromide were determined. The electrolytic separation factor for Cl isotopes was $1{\cdot}0060 \pm 0{\cdot}0005$ for the range 25° to 40°C. No significant dependence on either temperature or current density was observed.

2897 539.211

The significance of surface marks on fractured glass. MURGATROYD, J. B. *J. Soc. Glass Technol.*, 26, *pp.* 155–171 (*T*), *June*, 1942.—A study has been made of rib-marks and hackle-marks. A rib-mark is considered to represent a halt of the fracture, and a series of closely-spaced rib-marks indicates a fracture which moved with velocity < 1 cm./sec. Experiments are described by which these low fracture-velocities were obtained. Hackle-marks are caused by a large shearing force, causing simultaneous failure of the glass at several internal points. The knowledge gained about the conditions of formation of the two types of surface marks can be used to determine the conditions existing at the time of failure of a piece of glass. The origin, the direction of movement and the relative strength of the force causing fracture, can frequently be deduced, and from them the cause of failure may be ascertained.

2898 539.215.4 : 669.1

Influence of initial structure and rate of heating on the austenitic grain size of 0·5% carbon steels and iron-carbon alloy. DIGGES, T. G., AND ROSENBERG, S. J. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 33–40, *July*, 1942.—Tests were made to determine the influence of variations in initial structure and rate of heating through the transformation temperature range on the grain sizes at 1 475° and 1 600°F. of a high-purity alloy of Fe and C and two commercial steels each containing 0·5% C. Variations in initial structure had no effect on the grain size of the Fe-C alloy. Although the initial structure had some influence on the grain size of the steels, no correlation was found between the grain size and the spacing of pearlite or the form and distribution of the carbides. The rate of heating had a pronounced effect on the grain size of the alloy, and in some cases also influenced the grain size of the steels. The trend in the steels was the reverse of that of the alloy, in that the finest grains were obtained in the steels with slow rates of heating. [See Abstr. 1780 (1940)].

2899 539.217 : 536.653

The interaction between rubber and liquids. III. The swelling of vulcanized rubber in various liquids. GEE, G. *Trans. Faraday Soc.*, 38, *pp.* 418–422, *Sept.*, 1942.—The entropy of swelling of vulcanized rubber is estimated, and assumed independent of the nature of the swelling liquid. The heat of swelling is related to the cohesive energy of the liquid, and a value of 66 cal./cm.^{3} deduced for the cohesive energy density of rubber. The swelling power of a liquid can be approx. calculated if its cohesive energy and mol. vol. are known. Substantial agreement with theory is found in most cases, although it is necessary to consider aliphatic and aromatic liquids separately. The anomalously high swelling power of acids and alcohols arises from their association.

2900 539.26

X-ray diffraction analysis of protein denaturation. II. Spiegel-Adolf, M., and Henny, G. C. *J. Phys. Chem.*, 46, *pp.* 581–586, *May*, 1942.—[See Abstr. 1855 (1941)]. Characteristic sharpening of the backbone reflection of heat-denatured serum pseudoglobulin can be observed independent of previous coagulation. Changes in the X-ray diffraction pattern of heat-denatured pseudoglobulin are irreversible. Thyroglobulin behaves in a similar way. Casein and gelatin show no signs of heat denaturation nor sharpening of the backbone reflection. Alcohol denaturation in pseudoglobulin brings forth changes in the X-ray diffraction pattern similar to those observed in heat denaturation. This parallelism extends to the disappearance of these changes in a certain fraction upon reversal of the denaturation. Serum albumin denatured by adsorption to an interface is irreversibly changed in its water solubility. No backbone sharpening of the X-ray diffraction pattern of such a sample can be noticed, nor does such sharpening become visible upon subsequent heating. X-ray irradiation of dried pseudoglobulin does not bring forth characteristic changes in the X-ray diffraction pattern, although a partial absorption of the radiation by protein and induced cleavage of the latter has been ascertained.

See Abstr. 2928 539.26 : 531.754 : 541.23

2901 539.26 : 539.378.6

Studies of lead oxides. VI. The effect of grinding on the X-ray diffraction patterns of mixtures containing lead oxides. Clark, G. L., and Kern, S. F. *J. Amer. Chem. Soc.*, 64, *pp.* 1637–1641, *July*, 1942.—[See Abstr. 1905 (1941)]. Grinding mixtures of PbO_2 with either R-PbO or Y-PbO results in the disappearance of the X-ray diffraction lines characteristic of PbO. This is not the case when PbO is ground with an abrasive like silicon dioxide. The probable reasons are discussed. Grinding mixtures of PbI_2 and PbO results in the disappearance of the pattern of the PbI_2 while the PbO pattern remains. The PbI_2 acts as a lubricant and thereby protects the PbO from distortion. This lubricating action of the PbI_2 arises from the weak forces existing between layers of iodide ions in the PbI_2 crystals.

ELASTICITY. STRENGTH

See Abstr. 2869 539.31 : 536.758

See Abstr. 2901 539.378.6 : 539.26

2902 539.382

The extension and rupture of cellulose acetate and celluloid. Haward, R. N. *Trans. Faraday Soc.*, 38, *pp.* 394–403, *Sept.*, 1942.—Measurements were made on the extension and rupture of cellulose acetate and celluloid and the results are accounted for on the assumption that the 2 processes are largely independent. The significance of the various equations derived is discussed and it is shown that high impact resistance is associated with materials that extend suddenly and quickly under stresses that are high, but still lower than those required for immediate rupture.

2903 539.382 : 548 : 669.3

The influence of crystal size and orientation upon the mechanical properties of metals in the cast condition. Wood, W. A., Northcott, L. *J. Inst. Met.*, 9, *pp.* 281–282, *Aug.*, 1942.—[Abstr. 2405 (1942)]. Correspondence.

See Abstr. 2766 539.385 : 518.12

2904 539.4.016.3 : 620

The quenching of steel after tempering and the impact test. Benson, L. E. *Engineering*, 154, *pp.* 134–135, *Aug.* 14, 1942.—[Abstr. 1458 B (1942)].

2905 539.42 : 620.1 = 3

Effect of Si content on the yield point of S.-M. structural steel. Wyss, T. *Schweiz. Bauztg*, 119, *pp.* 136–137, *March* 21, 1942.—The Swiss specification for structural steel requires the following mechanical properties: tensile strength 36–47 kg./mm.^{2}, yield point at least 24 kg./mm.^{2}, longitudinal elongation 20%, and transverse elongation 17%. A structural steel containing 0·12% C and 0·46% Mn conformed to the specification in some respects but gave a limit of proportionality of 11·3 kg./mm.^{2} and a yield value of 20·4 kg./mm.^{2} This steel contained only a trace of Si. Normalizing the steel at 930°C. raised the limit of proportionality to 19·5 kg./mm.^{2} and increased the elongation values, but had no appreciable effect on the yield strength. A similar steel which contained 0·18% Si conformed to the specification, giving yield values of 26·7 kg./mm.^{2} It was concluded that no guarantee could be given that the steel would conform to the specification unless Si were present. A. C. W.

2906 539.53 : 669.1

Effect of moderate cold-rolling on the hardness of the surface layer of 0·34% carbon steel plates. Herschman, H. K. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 57–67, *July*, 1942.—The influence of moderate cold-rolling on the surface indentation hardness of 0·34% C steel plate initially surface-finished by 3 different methods was investigated. Indentation hardness tests were made with the Rockwell machine. The results obtained with the Knoop indenter showed lower hardness numbers for the superficial layer of the steel after the lighter degrees of rolling, the magnitude of change being influenced by the mode of initial finishing. Hardness decreases were not revealed by tests made with the Rockwell machine nor in any case in which the penetration of the Knoop indenter exceeded about 0·0003 in.

2907 539.536

The hardness and scratch resistance of plastics. A new method of test. Starkie, D. *J. Soc. Glass Technol.*, 26, *pp.* 130–144 (*T*), *June*, 1942.—The difficulties associated with conventional hardness tests on plastic materials are discussed, and a new method of test is devised in which a stream of carborundum particles is allowed to impinge on the specimen, and the scattering of light by the abraded spot thus produced is taken as a measure of the scratch resistance. The development of the test is described, and details are given of the precautions needed to ensure accurate and consistent results. The results of tests on some common materials are included.

2908 539.62

Mechanism of metallic friction. Bowden, F. P., and Tabor, D. *Nature, Lond.*, 149, *pp.* 197–199, *Aug.* 15, 1942.—When two metals are in contact, contact only occurs at the summits of the surface

irregularities. Measurements were made of the areas of contact by measuring the electrical conductance between the two metals and showed that the area of contact was small and almost independent of the apparent area of contact. It would be expected, therefore, that the frictional force would also be independent of the apparent area of contact. The conductivity measurements showed that the deformation of the surfaces in actual contact was mainly plastic. The metals flowed until the area of contact was sufficient to support the applied load, thus supporting Amontons' law. The adhesion and shear strength of a thin oxide layer is lower than that of a pure metal, and thus the presence of such a layer reduces the friction of two metallic surfaces in contact. If a steel surface be coated with a thin layer of indium and a hemispherical slider is placed on top, it will sink into the indium until supported by the steel and thus the area of contact will be almost independent of the load for further increments of load. Experiments show that in such a case the coeff. of friction decreases with increase of load and Amontons' law breaks down. A. C. W.

PHYSICAL CHEMISTRY

See Abstr. 2930 541.124 : 535.343 : 541.8

See Abstr. 2921, 2922 541.124.7 : 541.145

2909 541.127 : 537.2

The electrostatic influence of substituents on reaction rates. III. Solvent effect. WESTHEIMER, F. H., JONES, W. A., AND LAD, R. A. *J. Chem. Phys.*, 10, *pp.* 478–485, *July*, 1942.—The magnitude of the electrostatic effect of substituents on reaction vel. depends on the solvent in which the reaction is carried out. In order to investigate the influence of solvent, the first and second saponification const. of diethyl malonate and diethyl adipate have been measured in water and in 80% alcohol, in solutions of varying ionic strength. The saponification const. have been extrapolated to inf. dilution. The ratio of the first to the second vel. const. at inf. dilution in any one solvent is a measure of the effect of a charged substituent on the rate of saponification. The results are in agreement with theory. [Abstr. 4217 (1938)].

2910 541.127 : 541.183

Variation of reaction mechanism with surface conditions in the reduction of silver salts by hydroxylamine. JAMES, T. H. *J. Chem. Phys.*, 10, *pp.* 464–468, *July*, 1942.—AgBr oxidizes hydroxylamine at *p*H 10·2–10·8 to N and H_2O. Under comparable conditions, silver thiocyanate yields a mixture of N and N_2O as the gaseous products. By varying the surface conditions of the thiocyanate, the composition of the reaction product may be varied over a wide range. Small additions of bromide or iodide decrease the N_2O yield. With initial partial coverage of the precipitate surface by gelatin, the N_2O yield increases to a max. Ageing a fresh precipitate increases the yield. The results are explained by the effects of adsorption upon the relative rates of 2 competing reaction mechanisms.

2911 541.128

Catalytic activity of an intermetallic compound of cadmium and copper in the vapour-phase reduction of nitrobenzene. GRIM, R. J. *J. Phys. Chem.*, 46, *pp.* 464–469, *April*, 1942.—The intermetallic compound, Cd_3Cu_2, has appreciable catalytic power in the vapour-phase reduction of nitrobenzene to aniline between the temperatures of 260° and 342°C. The yield of aniline could not be increased by varying the rate of flow of hydrogen or nitrobenzene.

2912 541.128

The mechanism of the catalytic conversion of para-hydrogen on nickel, platinum and palladium. FARKAS, A., AND FARKAS, L. *J. Amer. Chem. Soc.*, 64, *pp.* 1594–1599, *July*, 1942.—The catalytic conversion of para-hydrogen was investigated at room temperature and a pressure of about 0·01 mm. on evaporated layers of Ni, Pd and Pt. There is a stable layer of H on the catalysts which is not removed by pumping at room temperature and which exchanges readily with mol. H or D. The rate of this exchange = the rate of the para-hydrogen conversion on Ni, but is smaller on Pd and Pt. The possible mechanisms for the conversion of para-hydrogen and exchange are discussed.

2913 541.128

Carboxylation. III. The peroxide-catalyzed reaction of oxalyl chloride with the side-chains of aralkyl hydrocarbons. A preliminary study of the relative reactivity of free radicals. KHARASCH, M. S., KANE, S. S., AND BROWN, H. C. *J. Amer. Chem. Soc.*, 64, *pp.* 1621–1624, *July*, 1942.—None of the aralkyl hydrocarbons were observed to undergo photochemical carboxylation with oxalyl chloride to any appreciable extent. An important factor in the inhibition of the photochemical reaction of oxalyl chloride with the aralkyl hydrocarbons appears to be the effect of the aromatic nucleus on the radiation required for the photolysis of the oxalyl chloride, the chain-initiating step. There is a correspondence between the order of the free radicals when arranged according to their reactivities and the electronegativity series of organic groups. A plausible interpretation of this correspondence is advanced.

2914 541.128

The catalysis of the thermal decomposition of acetaldehyde by hydrogen sulphide. ROTH, W. L., AND ROLLEFSON, G. K. *J. Amer. Chem. Soc.*, 64, *pp.* 1707–1711, *July*, 1942.—The reaction results in the formation of equivalent amounts of methane and CO with no net loss of H_2S. The effect of temperature on the rate was studied. The effects of adding H, S, carbonyl sulphide, methyl mercaptan, dimethyl sulphide and H_2O to the reaction mixture have also been studied.

2915 541.128.24 : 772

Oxidation processes. XIV. The effect of silver on the autoxidation of some photographic developing agents. WEISSBERGER, A., AND THOMAS, JR., D. S. *J. Amer. Chem. Soc.*, 64, *pp.* 1561–1567, *July*, 1942.—The oxygen absorption of hydroquinone at various rates of shaking was investigated to check the conditions under which the O conc. in the liquid phase remains const. The rate of autoxidation between *p*H 7 and 8·2 increases with the (hydroxyl-ion conc.)^2. Ag accelerates the autoxidation of hydroquinone, catechol, *p*-aminophenol and glycine only to a very small degree. The autoxidation of *p*-phenylenediamine and *p*-dimethylaminoaniline shows a more considerable catalysis by Ag. The addition of Ag

strongly diminishes the total amount of O which is absorbed by the developing agents in alkaline solutions. This is chiefly caused by a catalytic effect of the Ag on reactions of peroxide formed in the autoxidation.

2916 541.132

Studies of ionization in non-aqueous solvents. V. The formation of certain methoxides and ethoxides in methyl and in ethyl alcohol. GERMAN, W. L., AND BRANDON, T. W. *J. Chem. Soc., pp.* 526–528, *Aug.*, 1942.—The reactions between solutions of sodium methoxide and of sodium ethoxide and conveniently soluble salts in methyl and ethyl alcohols have been studied with the aid of conductivity titrations. As with dilute solutions of NaOH in water, the reactions, in most cases, lead to the formation of basic compounds.

2917 541.132

Theory of the iso-electric point. II. HILL, T. L. *J. Phys. Chem.*, 46, *pp.* 597–605, *May*, 1942.—[See Abstr. 2432 (1942)].—The modifications introduced in the iso-electric point and some of its properties by including activity coeff. and thermodynamic equilibrium const. are discussed and some examples given. Colligative properties and ionic strength are mentioned.

See Abstr. 2829 541.132 : 532.713

See Abstr. 2868 541.132 : 536.75

See Abstr. 2870 541.132 : 541.8 : 536.77

2918 541.133

Conductivity studies. III. The limiting equivalent conductances of potassium chloride in water at temperatures between 15° and 40°. LI, N. C. C., AND FANG, H. **IV. The limiting ionic mobilities of several univalent ions at temperatures between 15° and 45°.** LI, N. C. C., AND BRÜLL, W. *J. Amer. Chem. Soc.*, 64, *pp.* 1544–1547 *and* 1635–1637, *July*, 1942.—The experimental data follow closely the Onsager limiting slope at high dilutions. At other conc. only 1 empirical const. is needed. The temperature dependence of the limiting conductance is linear between 15° and 40°. Tables are given of the limiting mobilities of K and chloride ions at 15°, 25°, 35° and 45°. Approx. values for the limiting mobilities of Na and acetate as well as the limiting transference numbers in aq. solutions for these temperatures are also given.

2919 541.134 = 6

On the theory of not excessively diluted solutions of strong electrolytes. CERNUSCHI, F. *Rev. Univ. Tucumán A*, 2, *pp.* 95–107, *Dec.*, 1941.—Exciting theories (Debye–Hückel, etc.) are critically examined. Taking into account the interaction between neighbouring ions, a statistical theory is developed which agrees better with experimental data.

See Abstr. 2896 541.135 : 539.155.2

2920 541.144 : 541.183

Photoactivation of adsorption of hydrogen on thorium oxide. LUYCKX, A., BODART, J., AND RENS, G. *J. Amer. Chem. Soc.*, 64, *pp.* 1731–1732, *July*, 1942.

2921 541.145 : 541.124.7

The effect of intermittent light on a chain reaction with bimolecular and unimolecular chain-breaking steps. RICE, O. K. *J. Chem. Phys.*, 10, *pp.* 440–444, *July*, 1942.—It is shown how to calculate the reaction rate as a function of the sector speed for different values of a certain parameter which depends on the individual rate const. and the light intensity and gives the rel. importance of the bimolecular and unimolecular chain-breaking steps. The relationships are exhibited graphically for the case in which $\frac{1}{4}$ of the sector passes the light beam.

2922 541.145 : 541.124.7

The chain photolysis of acetaldehyde in intermittent light. HADEN, JR., W. L., AND RICE, O. K. *J. Chem. Phys.*, 10, *pp.* 445–460, *July*, 1942.—By comparison of the data on the photochemical decomposition and the azomethane-induced decomposition of acetaldehyde vapour, it is concluded that the chain-carrying steps in the two cases are different. Experiments were performed with intermittent light at 200° and 300°. Estimates are made for the individual rate const. There is little evidence of necessity for mutual orientation of the molecules. The significance of this is discussed.

See Abstr. 2860 541.18 : 535.514.9

2923 541.18 : 536.775

Studies on high-molecular-weight aliphatic amines and their salts. VII. The systems octylamine–, dodecylamine– and octadecylamine–water. RALSTON, A. W., HOERR, C. W., AND HOFFMAN, E. J. *J. Amer. Chem. Soc.*, 64, *pp.* 1516–1523, *July*, 1942.—The systems octylamine–water, dodecylamine–water and octadecylamine–water were investigated. The phase rule is applied to these systems.

2924 541.18 : 537.228.3

Electro-optical properties of colloids. MUELLER, H., AND SAKMANN, B. W. *J. Opt. Soc. Amer.*, 32, *pp.* 309–317, *June*, 1942.—Large electro-optical anomalies, varying in an unexpected and unexplained manner with the intensity and frequency of the applied field and the conc. of the solution, are investigated. In this preliminary paper the experimental method is described and discussed. Visual or photographic observations cannot distinguish between a steady and an alternating optical shift (phase shift of incident plane polarized light emerging as elliptically polarized light), hence the theory and application of a photoelectric method is developed for, mainly, sols of white and yellow bentonite. N. M. B.

See Abstr. 2927 541.182.5 : 541.183.2

2925 541.182.6 : 537.213

The effect of electrical forces on the stability of colloidal sols. EVERSOLE, W. G., AND HANSON, A. L. *J. Chem. Phys.*, 10, *pp.* 460–463, *July*, 1942.—It is assumed that the stabilizing potential in a sol is not the potential at a distance t from the surface of the particle, but the potential (λ) at a distance l from the solid surface at which a max. in the potential-energy curve determines the rate of coagulation, and γ is a constant for a given sol in states of equal stability.

2926 541.182.63 : 532.612

Studies on ageing and coprecipitation. XXXV. Ageing of lead chromate in the colloidal state. Thermal ageing. KOLTHOFF, I. M., AND EGGERTSEN, F. T. *J. Phys. Chem.*, 46, *pp.* 458–463, *April*, 1942.—The sp. surface of $PbCrO_4$ was found to decrease only slightly when it was allowed to stand for 3 hr. in the

colloidal state. The longer the period of pre-ageing, the more rapid the rate of ageing after flocculation. This is explained on the basis of a desorption of the stabilizing chromate ions. No thermal ageing in the dry state occurs at room temperature, but a pronounced ageing was found upon heating at 355°C. Upon heating at 220°C. the sp. surface did not change, but the rate of penetration of ThB at room temperature decreased markedly with increase in the period of heating.

See Abstr. 2910 541.183 : 541.127

See Abstr. 2920 541.183 : 541.144

See Abstr. 2872 541.183.1 : 536.659 : 532.62 : 536.775

2927 541.183.2 : 541.182.5

The elimination of sorption-desorption hysteresis in hydrous oxide systems. I. Silica. WEISER, H. B., MILLIGAN, W. O., AND HOLMES, J. *J. Phys. Chem.*, 46, *pp.* 586–596, *May*, 1942.—Increasing the temperature of precipitation of silica gel from water-glass solution causes a marked decrease in the distance apart of the curves of the sorption-desorption hysteresis loop. This results from the effect of increased temperature on the structure of the colloidal particles in the water-glass solution. Increasing the temperature of precipitation from freshly formed sodium metasilicate causes only a relatively small decrease in this distance. The difference in the influence of temperature results from the presence of much larger amounts of colloidal silica in the solutions of water glass than in solutions of freshly formed sodium metasilicate. The water sorption and desorption curves for a gel precipitated from a sodium metasilicate solution hydrolysed and aged by prolonged boiling follow the same course without any hysteresis loop. A brief review is given of the theories of gel structure.

2928 541.23 : 531.754 : 539.26

Atomic-weight comparisons from density and X-ray data: fluorine, calcium and carbon. HUTCHISON, C. A. *J. Chem. Phys.*, 10, *pp.* 489–490, *July*, 1942.

See Abstr. 2767 541.25 : 518.3

See Abstr. 2892 541.54 : 539.133

See Abstr. 2858 541.57 : 535.375.5

See Abstr. 2851 541.632 : 535.342

2929 541.8

The effect of salts on the mutual miscibility of normal butyl alcohol and water. REBER, L. A., MCNABB, W. M., AND LUCASSE, W. W. *J. Phys. Chem.*, 46, *pp.* 500–515, *April*, 1942.—The curve of limiting miscibility for the binary system *n*-butyl-alcohol-water was redetermined over the range 30 to 90% water, and from 90°C. to the critical solution temperature, 124·40°C. The composition at the critical point was 68·1% water. The effect of the addition of salts to this system was studied at various concentrations.

2930 541.8 : 541.124 : 535.343

Complex ions. III. A study of some complex ions in solution by means of the spectrophotometer. GOULD, R. K., AND VOSBURGH, W. C. *J. Amer. Chem. Soc.*, 64, *pp.* 1630–1634, *July*, 1942.—[See Abstr. 281 (1942)]. A number of systems have been examined by the method of continuous variations. In the 3 systems Fe(III) and thiocyanate ions, Fe(II) and *o*-phenanthroline, and Ni and dithio-oxalate ions, evidence was obtained for only 1 compound each, the compounds being known. From Cu and aminoacetate ions evidence of 2 compounds was obtained, with the components in ratios of 1 : 1 and 1 : 2, respectively. From Ni and aminoacetate ions evidence was obtained for a 1 : 3 compound and one other which could not be identified.

See Abstr. 2870 541.8 : 541.132 : 536.77

2931 542.3 : 531.733

Micro-gas analyser. SCHOLANDER, P. F. *Rev. Sci. Instrum.*, 13, *pp.* 264–266, *June*, 1942.—The analyser consists of an absorption chamber fitted to a micrometer burette in which the micrometer spindle is replaced by a fine drill rod which by rotation controls the movement of the Hg column. The reagents are contained in and fed from 2 cm.^{3} syringes. Gas samples are handled by a transfer pipette. Vols. $\leqslant 0{\cdot}001$ cm.^{3} can be analysed with an accuracy of $\sim 0{\cdot}1\%$ in ~ 10 min. N. M. B.

2932 542.7

Glass valve pressure regulator. CALDWELL, M. J., AND BARHAM, H. N. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *p.* 485, *June* 15, 1942.

2933 542.8

An apparatus for the determination of soluble bromide. EHRLICH, J. *Trans. Faraday Soc.*, 38, *pp.* 389–391, *Sept.*, 1942.—A cell for the electrometric determination of soluble halide is described. The chain

Pt | Hg, Pb | $PbSO_4$ | $MgSO_4$ | Unknown | AgBr | Ag

is shown to give reliable and reproducible results.

2934 545.371

Some observations upon the precipitation of hydrous cadmium hydroxide in the presence of certain anions. MOELLER, T., AND RHYMER, P. W. *J. Phys. Chem.*, 46, *pp.* 477–485, *April*, 1942.—Electrometric titrations of Cd nitrate, sulphate, chloride, bromide and iodide solutions, both alone and in the presence of added alkali salts, indicate the formation in solution of anionic Cd-containing complexes in all instances except the nitrate. The stabilities of these complexes are functions of the quantity of added anion and increase in the order chloride < sulphate < bromide < iodide. The *p*H at which precipitation begins increases with the degree of complex formation. Precipitation of $Cd(OH)_2$ can be completely inhibited by alkali iodide, bromide or chloride, the effectiveness decreasing in that order.

2935 545.38

Conductometric titrations in non-aqueous solutions. PINKSTON, J. T., AND BRISCOE, H. T. *J. Phys. Chem.*, 46, *pp.* 469–473, *April*, 1942.—Amino acids can be successfully titrated conductometrically in monoethanolamine.

CRYSTALLOGRAPHY

2936 548 : 539.11 : 532.614.2 : 536.658

Energy relations of the surfaces of solids. II. Spreading pressure as related to the work of adhesion between a solid and a liquid. HARKINS, W. D., AND LIVINGSTON, H. K. *J. Chem. Phys.*, 10, *pp.* 342–

356, *June*, 1942.—[See Abstr. 2476 (1942)]. The paper is divided into 9 sections which include the consideration of energy of phase transfer, the total energy of adhesion and of immersion, the spreading pressure with the free energy of transfer from a liquid to its saturated vapour, the work of adhesion between a solid and a liquid, the adhesion tension, the spreading pressure with contact angle > 0 and the angle between a water/oil interface and the surface of a solid together with the displacement pressure. It is shown that the equations in the literature which relate the displacement pressure to the adhesion tension are incorrect and too simple. H. H. HO.

2937 548 : 620.19

The effect of crystal size on the resistance of copper alloys to corrosion by sea water. COOK, M., AND BOODSON, I. *Trans. Faraday Soc.*, 38, *pp.* 391–394, *Sept.*, 1942.—Grain size within the limits considered does not affect the resistance of the alloys to corrosion by sea water. Individual results obtained on similar specimens are in good agreement.

See Abstr. 2960 548 : 669.14

See Abstr. 2903 548 : 669.3 : 539.382

2938 548.73

The crystal structure of calcium cyanamide. BREDIG, M. A. *J. Amer. Chem. Soc.*, 64, *pp.* 1730–1731, *July*, 1942.

2939 548.73

Some X-ray diffraction measurements on biotin. FANKUCHEN, I. *J. Amer. Chem. Soc.*, 64, *pp.* 1742–1743. *July*, 1942.

2940 548.73 : 669.14 = 3

The state of carbon in annealed steel. ARBUSOW, M., AND KURDJUMOW, G. *J. Phys., U.S.S.R.*, 5, 2–3, *pp.* 101–108, 1941.—X-ray examination of steel single crystals annealed in the range 130°–300°C. shows that the decomposition of martensite is accompanied by the precipitation of a new carbide phase which is highly dispersed and has a different structure from Fe_3C. With increase of temperature to just over 300°C. the structure slowly changes to that of Fe_3C and the change proceeds fairly quickly between 350°–380°C. J. T.

GEOPHYSICS

See Abstr. 2886, 2887 550.38 : 538.75

2941 550.384.4

Main features of the daily magnetic variations at Cape Town. GOTSMAN, B. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 165–170, *June*, 1942.—Nine curves are given for each element H, D and Z, to express the influence of season and magnetic disturbance on the average daily magnetic variation 1933–40. Twelve curves are given for each element to express the influence of season, sunspot-cycle and magnetic disturbance.

2942 550.385

Giant micropulsations. OGG, A. *Terr. Magn. Atmos. Elect.*, 47, *p.* 176, *June*, 1942.

2943 550.385

Principal magnetic storms, January to March, 1942. GEBHARDT, R. E., LUDY, A. K., NELSON, J. H. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 177–178, *June*, 1942.—Data from Sitka, Cheltenham and Tucson.

2944 550.385 : 523.746

Solar and magnetic data, January to March, 1942, Mount Wilson Observatory. NICHOLSON, S. B., AND MULDERS, E. S. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 174–176, *June*, 1942.

2945 550.389.13

American *URSI* broadcasts of cosmic data, giving American magnetic character-figure, C_A, for January to March, 1942, three-hour-range indices, K, and mean K-indices, K_A, for October, 1941, to March, 1942. JOHNSTON, H. F. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 159–164, *June*, 1942.—[See Abstr. 1982 (1942)].

2946 551.506.8

Discussion on the report on the phenological observations in the British Isles from December, 1940, to November, 1941. *Quart. J. Roy. Met. Soc.*, 68, *pp.* 229–233, *July*, 1942.

2947 551.509.33 : 551.578.1 : 551.513.7

The foreshadowing of the rainfall of Burma. MAUNG PO E. *Quart. J. Roy. Met. Soc.*, 68, *pp.* 217–225; *Disc.*, 225–228, *July*, 1942.—A statistical study is made of Burma rainfall, June to August, in relation to world weather, and the results are applied to seasonal foreshadowing. Burma is divided into 5 rainfall regions and the correlation coeff. between the rainfalls of these regions and pressure, temperature and rainfall over other parts of the world are evaluated for the contemporary quarter and 1 and 2 quarters earlier. Foreshadowing with a 4:1 chance of success can be made for the 2 regions concerned only in a relatively small proportion of years. Even with the third formula, for which the total correlation coeff. is 0·64, foreshadowing on this basis would be possible only for less than 1 year in 3.

2948 551.510.535

Height of maximum electron-density in the ionosphere. BOOKER, H. G. *Terr. Magn. Atmos. Elect.*, 47, *p.* 173, *June*, 1942.—[See Abstr. 916 (1940)].

See Abstr. 2800 551.510.535 : 523.78 : 621.396.812.5

See Abstr. 2947 551.513.7 : 551.578.1 : 551.509.33

2949 551.521.3

Emission and absorption of radiation in the atmosphere. *Quart. J. Roy. Met. Soc.*, 68, *pp.* 197–216, *July*, 1942.—A discussion at a joint meeting of the Physical Society and the Royal Meteorological Society, containing the following papers: The absorption of infra-red radiation in the atmosphere, Cowling, T. G.; The emission spectrum of water as observed in flames, Gaydon, A. G.; Atmospheric radiation and the temperature of the lower stratosphere, Dobson, G. M. B.; The infra-red absorption of atmospheric gases, Kellner, L.; The non-existence of the solar spectrum in the region, $\lambda\lambda 2\,200$–$2\,100$, Dingle, H.; Radiation from the night sky, Pearse, R. W. B.; Review of recent measurements of atmospheric emissivity in the infra-red, Sheppard, P. A.; Detection of small traces of non-rare gases in the atmosphere by infra-red spectra, Sutherland, G. B. B. M.

2950 551.521.3 : 551.524.7

Atmospheric radiation and the temperature of the lower stratosphere. DOBSON, G. M. B. *Quart. J. Roy. Met. Soc.*, 68, *pp.* 202–204, *July*, 1942.

2951 551.521.6

The non-existence of the solar spectrum in the region $\lambda\lambda 2\,200$–$2\,100$. DINGLE, H. *Quart. J. Roy. Met. Soc.*, 68, *pp.* 206–207, *July*, 1942.

2952 551.521.9

Radiation from the night sky. PEARSE, R. W. B. *Quart. J. Roy. Met. Soc.*, 68, *pp.* 208–210, *July*, 1942.

See Abstr. 2950 551.524.7 : 551.521.3

2953 551.555.8

An unusually long-lived dust devil at Poona on the 27th March, 1942. RAMAN, P. K. *Curr. Sci.*, 11, *pp.* 231–234, *June*, 1942.

2954 551.571 : 518.3

Nomographic charts for vapour pressure. BEARDSLEY, K. D. *Gen. Elect. Rev.*, 45, *pp.* 281–283, *May*, 1942.—An alignment chart is given for wet- and dry-bulb temperatures and the derived scale of v.p. It is based on 29 in. Hg, and if a considerable departure is present a second chart is used to provide a correction. The temp. scales are in deg. F.

E. H. W. B.

See Abstr. 2947 551.578.1 : 551.513.7 : 551.509.33

2955 551.579.4 : 631.43

A new phenomenon in the movement of the free water-level in a soil and its bearing on the measurement of water-table. VAIDHIANATHAN, V. I., AND SINGH, C. *Proc. Indian Acad. Sci.*, 15, *pp.* 264–280, *April*, 1942.—Experiments have been conducted to study the effect of evaporation on the subsoil water movement in soils consisting of homogeneous and heterogeneous strata. The samples were packed in cylinders 200 cm. high and 8 cm. dia. The level of free water in the subsoil was measured in a side tube. The first series of investigations were carried out when the tank was completely filled with (1) coarse sand, (2) fine sand, and (3) very fine sand. The specimens of fine and very fine sand have been mechanically analysed. The second series of experiments were carried out with coarse sand at the bottom and different thicknesses of layers of fine or very fine sand at the top.

See Abstr. 2801 551.593.55 : 523.78

2956 551.594.221 : 621.3.015.3

Field investigations of lightning. WAGNER, C. F., MCCANN, G. D., AND BECK, E. *Trans. Amer. Inst. Elect. Engrs*, 60, *pp.* 1222–1230; *Disc.*, 1381–1382, 1941.—[Abstr. 1478 B (1942)].

2957 551.594.221 : 621.3.015.3

Lightning strokes in field and laboratory. III. BELLASCHI, P. L. *Trans. Amer. Inst. Elect. Engrs*, 60, *pp.* 1248–1256; *Disc.*, 1392–1393, 1941.—[Abstr. 1479 B (1942)].

2958 551.594.221 : 621.315 : 621.316.93

Shielding of transmission lines. WAGNER, C. F., MCCANN, G. D., AND MACLANE, JR., G. L. *Trans. Amer. Inst. Elect. Engrs*, 60, *pp.* 313–328; *Disc.*, 612–614, 1941.—[Abstr. 1515 B (1942)].

VARIOUS SUBJECTS

2959 615.12

A portable apparatus for continuous intravenous anaesthesia or blood transfusion. SIMS, A. L., AND LUCAS, B. G. B. *J. Sci. Instrum.*, 19, *pp.* 136–137, *Sept.*, 1942.—An apparatus for intravenous therapy is described which is portable, robust in construction and foolproof in action. Moving parts are reduced to a minimum so facilitating manufacture. The machine is easily sterilized in one piece and fits a transfusion bottle which is standard in most parts of this country. Difficulties in transfusion due to defects in apparatus caused by faulty maintenance do not occur. After use the machine is washed through with saline and is then ready for use again after sterilizing.

See Abstr. 2955 631.43 : 551.579.4

See Abstr. 2862 666.22 : 535.81

See Abstr. 2898 669.1 : 539.215.4

2960 669.14 : 548

The crystal structures of Fe, FeO and Fe_3O_4 and their interrelations. GOLDSCHMIDT, H. J. *J. Iron Steel Inst.*, [18 *pp.*], *Aug.*, 1942.—A simple relation exists between the lattice dimensions of the 3 phases of the iron-oxygen system: α-iron (Fe), wüstite (FeO) and magnetite (Fe_3O_4). The close connection between the 3 structures, which are all cubic, explains why a comparatively easy transition from Fe to FeO, from Fe to Fe_3O_4 and from FeO to Fe_3O_4, is possible under practical oxidizing conditions implying limited access of O. While the transition $Fe \rightarrow FeO$ is considered as a true oxidation, the change $FeO \rightarrow Fe_3O_4$ is not, because the number of O ions per crystal vol. remains const., only Fe being lost. The structure of γ-iron is connected with that of FeO, a fact which is corroborated by comparing the atom. vol. of all the phases concerned. Similar relations exist between α-Fe and Fe_3O_4 on the one hand and γ-Fe and FeO on the other, each pair of phases being thus fundamentally associated, and the γ–α change at 906°C. is coupled with the decomposition of FeO at 570°C.: [$4FeO \rightarrow Fe + Fe_3O_4$]. The facts have a bearing on corrosion resistance of steel.

See Abstr. 2940 669.14 : 548.73

See Abstr. 2903 669.3 : 548 : 539.382

See Abstr. 2845 77 : 535.247

See Abstr. 2855 771.53 : 535.349

See Abstr. 2915 772 : 541.128.24